SOUTHERN POWER AND INDUSTRY

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FEBRUARY, 1953

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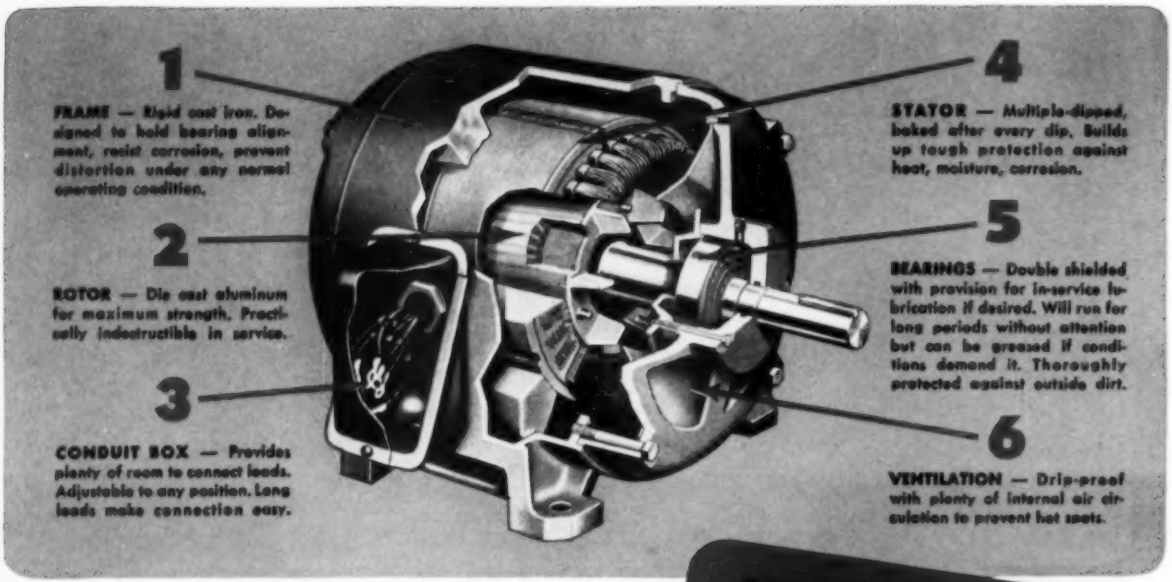
1
FRAME — Rigid cast iron. Designed to hold bearing alignment, resist corrosion, prevent distortion under any normal operating condition.
2
ROTOR — Die cast aluminum for maximum strength. Practically indestructible in service.
3
CONDUIT BOX — Provides plenty of room to connect leads. Adjustable to any position. Long leads make connection easy.
4
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5
BEARINGS — Double shielded with provision for in-service lubrication if desired. Will run for long periods without attention but can be greased if conditions demand it. Thoroughly protected against outside dirt.
6
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Volume 71 Number 2

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SOUTHERN POWER AND INDUSTRY

FEBRUARY 1953

Vol. 71 No. 2

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Managing Director

Francis C. Smith, Editor

Richard L. Priess
Associate Editor

Hunter Hughes
Regional Editor

M. M. Lyon
Associate

J. A. Moody
Production Manager

Business Representatives

E. L. Rogers, 299 Madison Ave., New York 17, N. Y.—Phone Murray Hill 2-4959.

George Isherwood, 413 Alexander Ave., Drexel Hill, Pa.—Phone, Clearbrook 9-4536.

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

February, 1953

► SOUTHERN & SOUTHWESTERN PROGRESS will continue at a high level. A recent report of the Southern Association of Science and Industry discloses that private electric utility firms are investing approximately $5 billion in new facilities to provide adequate power for industrial and residential growth during the 1946-56 decade.

Digest of the extensive report, published in this issue of SP&I, features a detailed tabulation of actual expenditures for 1946-51 and anticipated expenditures for 1951-56 for new facilities. Major Southern utilities expect to invest about as much in new facilities during the next five years as they have during the previous five, which was a period of remarkable growth.

Another tabulation "The South Compared with Other Regions" shows total expansion in the Southern states, 1946-54, will be nearly $5 billion. Total for New England is less than $1 billion, and expansion in one Southern state (Texas) is greater than for all New England. Likewise, Southern expansion is greater by nearly $2 billion than in the Middle Atlantic States.

► UNUSUAL REHEAT CYCLE, outdoor installation and a special arrangement of control panels are features of Carolina Power & Light Company's newest generating unit near Goldsboro, North Carolina. All steam generating equipment, except coal conveyor and coal pulverizers, is located outdoors. Turbo-generators, except for a small steel enclosure at the head end of the turbines, are on an open deck. Design and operating features are noted in this issue of SP&I by James A. Jones, Senior Engineer of the Carolina Power & Light Company.

High pressure, superheated steam from the boiler flows to the high pressure section of the turbine, from which it is returned to the reheater section of the boiler. There it is reheated to initial temperature and delivered to the reheat turbine section -- and then to the low pressure turbine section.

► COLD PRESSURE WELDING TRENDS -- In conventional welding, heat anneals the metal and reduces its tensile strength. Cold pressure welding work-hardens the metal. New hand tool, announced by Utica Drop Forge & Tool Corporation, in co-operation with the Koldweld Corporation, facilitates welding of aluminum and copper without heat, current, acids, fluxes, or chemicals.

When butt-welding wires, it is as simple as inserting the two wire ends into a small hand device and squeezing plier-like handles. Job is accomplished in this way in a matter of seconds and no specialized skill is required. For details write Utica Drop Forge & Tool Corporation, Utica, New York.

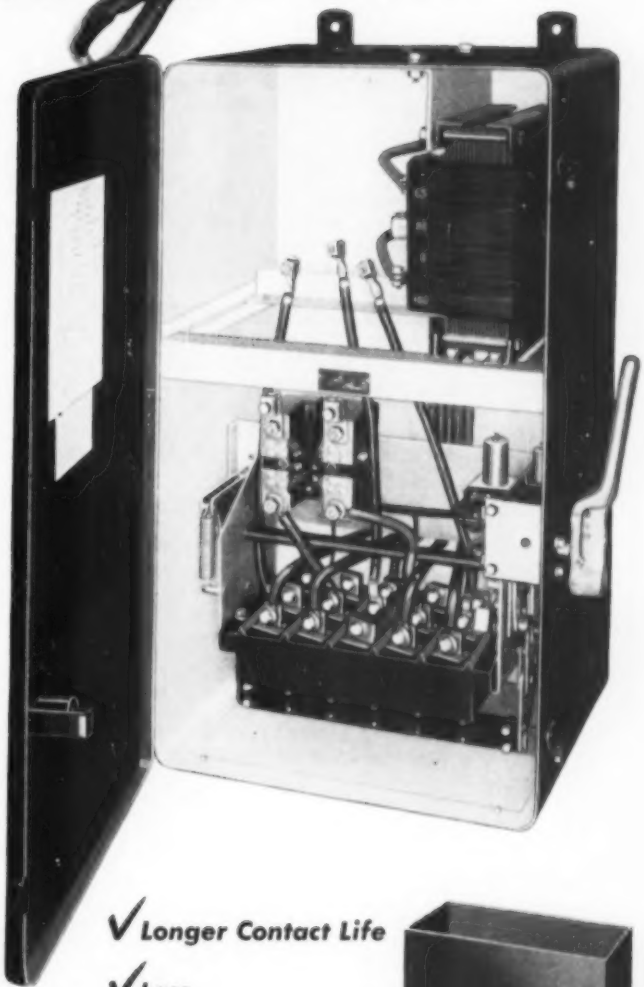
(Continued on page 6)

Avoid messy oil

Specify **Bulletin 646**
Manual Transformer Type
REDUCED VOLTAGE STARTERS
with
air break contacts

Never before has a manually operated auto-transformer-type starter been available in such high ratings with air break contacts. Starters rated up to 75 hp, 220 volts; 150 hp, 440-550-600 volts have air break silver alloy contacts that require no cleaning, filing, or dressing. This eliminates contact maintenance . . . results in longer contact life . . . avoids dirty, messy jobs. Only the Size D starter—rated up to 125 hp, 220 volts; 250 hp, 440-550-600 volts—requires oil immersed, copper to copper contacts. Write for Bulletin 646.

Allen-Bradley Co.
1328 S. Second St., Milwaukee 4, Wis.



Close-up of stationary contact block and movable contacts.

✓ *Longer Contact Life*

✓ *Less Maintenance*

✓ *Double Break, Silver Alloy Contacts*

Where special conditions must be satisfied, the standard Bulletin 646 Starter can be supplied with an oil tank.

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SAN DIEGO—James A. Setchell, 301 W. "G" St., Tel: Franklin 3981
TULSA—John W. Elder, 1341 S. Boston, Tel: 3-0950

facts and trends (continued from page 4)

► PLANT ELECTRICIANS will want to check the new line of electrical connectors and installation tools illustrated in "New Equipment and Supplies" starting on page 8. Feature of the F. M. Anthony Company equipment is a single mechanical type portable hand crimping tool, which makes a full circumferential crimp capable of handling a range of wire and cable sizes from #4 up through 500 MCM without the changing of dies or application of heat. Tool, weighing only 2¼ lb, works on a ratchet principle and rolls a crimp into the connectors and lugs.

► USING CARBIDE TOOLS? -- New abrasive belt finishing development is claimed to prcduce a micro-finish without diamond wheels. Norton Crystolon wheels, a Fenlind micro finisher and Behr-Manning carbide tool abrasive paper belts not only save the cost of diamond wheels, but also greatly extend the cutting service life of the tools. For details write Behr-Manning, Troy, New York.

► ELECTRICAL INSULATING COMPOUND that comes in a roll and applies like tape is described in the New Equipment section of this issue. Called "Scotchfil" putty, the black, 1/8 in. thick material fuses into a void-free mass after application. It is designed not only to insulate, but also to pad sharp edges as on bus bars, build up cable splices, and fill voids around irregular-shaped connectors quickly and conveniently prior to taping.

► NEW BUILDING PROCEDURES -- soil stabilization by mechanical compacting and erecting concrete structures by use of hydraulically operated forms. The first large plant in the United States to be constructed on sand compacted by vibroflation will be completed early in 1953 at Bonnie, Florida. At another location, high concrete piers were being poured by conventional methods in 3½ weeks. Changing to the new method (continuous lifting of forms and continuous pouring) reduced the time to 3½ days.

► INDIVIDUAL AND CORPORATION TAXES will always be painful. But they need not be as destructive to economic expansion and to individual incentive as the present hit-or-miss tax system.

The present total tax burden is greater than at the peak of World War II. In fiscal 1944, the Federal government collected $44 billion. In fiscal 1953, revenues will reach an estimated $69 billion.

How about the individual taxpayer picture? In just three years, between 1949 and 1952, the tax liability of low income taxpayers increased some 30 per cent. It is no wonder that a $3,500-a-year man today pays almost a third of his income in direct and hidden taxes.

Corporations today find themselves paying up to 82 cents of every dollar of profit to the Federal Government. Between 1949 and 1952, the tax liability of a small corporation with a net income of $25,000 jumped 30 per cent, from $5,750 to $7,500 -- not including any possible excess profits tax. A company with a net income of a million dollars had a 35 per cent increase in tax liability, from $380,000 to $514,500 -- not including EPT.

In this issue, John W. Hanes, native of North Carolina, and Chairman, Tax Foundation, outlines the opportunities for tax reduction and more equitable distribution of the tax burden. Read "Opportunities for Tax Reduction" -- prepared especially for SP&I by a recognized leading authority on Federal taxes and tax policies.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY. 806 Peachtree St., N.E. Atlanta 5, Ga.

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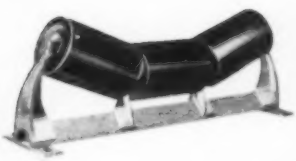
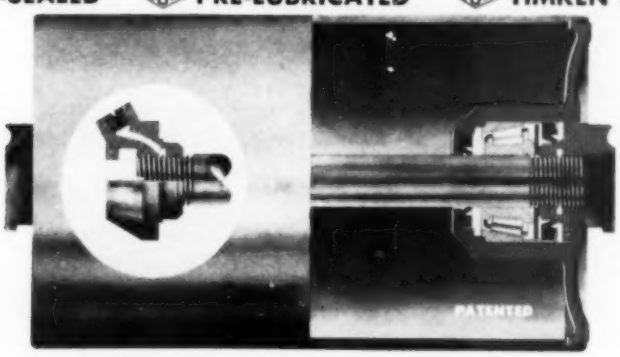


CGC UNIT-SEALED CGC PRE-LUBRICATED CGC TIMKEN BEARINGS



Saves Grease!
Saves Labor!
Saves Belts!
Long Life— THE ULTIMATE IN MINIMUM MAINTENANCE

Continental's Unit-Sealed "UST" Conveyor Idlers, incorporating Timken Bearings, Garlock Klozures, are the answer to the operator's prayer.

The Unit Bearing Assemblies—"sealed unto themselves" provide an ample but not excessive grease reservoir. This represents a saving of grease and further eliminates any possible migration of the grease from upper to lower bearings on inclined rolls. The lubricant is a top quality water repellant grease of a stable consistency with a wide temperature range for long life.

Most important—this construction permits operating the Continental "UST" Idler for extended periods of time without relubrication for 1-2-3 years or longer depending upon the severity or character of conditions.

For detailed information on these idlers write for Bulletin S.I.-116

CG-5210

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

NEW EQUIPMENT and SUPPLIES for the Plant Engineer and Operating Force

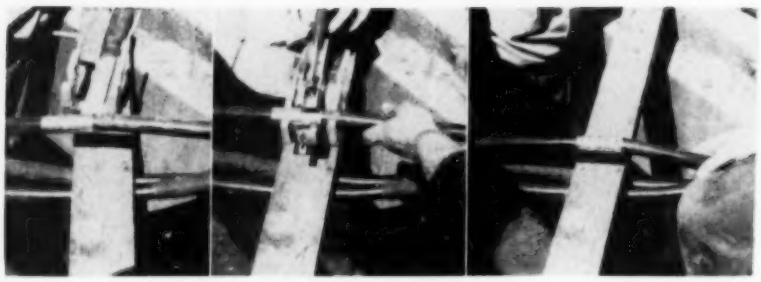
Electrical Connectors and Installation Tools

C-1 THE F. M. ANTHONY COMPANY, 2022 Oakland Avenue, Piedmont 11, Calif., is now manufacturing and marketing a new line of electrical splicing connectors, terminal lugs, rubber and Neoprene insulating sleeves, and crimping tools under the name of Insul-Lock.

Feature of the new line is the single mechanical type portable hand crimping tool illustrated. It is easily operated in a restricted space and is ideal for use in steel mills, mines (single and multiple conductor cable), railroad shops, and other general industrial plants. In addition to the portable tool there is available a line of bench tools for shop use.

For welding cable, the company markets in addition to connectors and lugs pre-molded rubber and Neoprene insulating sleeves which can be put on over the splicing connectors with a special mounting tool. This method saves time over conventional taping and affords a "permanent" job.

All Insul-Lock terminal lugs and splicing connectors fit the conductor perfectly and have greater area in circular mils than the cables for which they are designed. This means that under the same conditions, the Insul-Lock connectors have greater electrical carrying capacity than the same size cable.



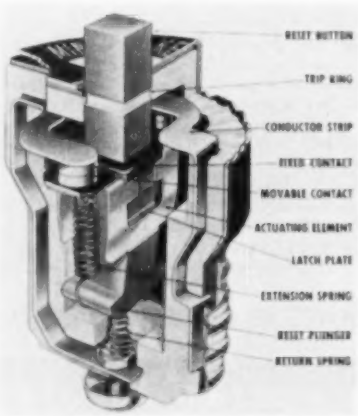
Feature of the *F. M. Anthony Company* line is a single mechanical type portable hand crimping tool which makes a full circumferential crimp and will crimp a range of wire and cable sizes from #4 up through 500 MCM without the changing of dies or application of heat. Tool is light (2¾ lb) and is simple to operate. It works on a ratchet principle and rolls a crimp into the connectors and lugs.

Electrical Circuit Protector

C-2 MECHANICAL PRODUCTS, INC., 1824 River St., Jackson, Mich., is producing the "Mini-Breaker," a new permanent type circuit protective device that fits like a fuse in any standard Edison base fuseholder delivering up to 125 v a-c service.

The new device meets the Underwriters' Laboratories, Inc. requirements for listing as a "Circuit Protector" and as such is an inspected device. Mini-Breakers are applicable to main as well as branch circuits of corresponding 15, 20, and 30 amp ratings delivering up to 125 v a-c service.

Free additional information is available to readers of SP&I. Circle the item code number on one of the reader service post cards provided on page 17-18.



Here's how *Mini-Breaker* protects your circuits. Under normal line conditions, current passes through conductor strip and actuating element, which carries pair of movable contacts. On direct "short" or sustained overload, excessive heat causes bimetal element to bend away from latch plates on both sides of center reset plunger. A preloaded return spring then forces plunger outward, while twin extension springs pull the element and movable contacts away from the fixed contacts, thus breaking the circuit.

In the "tripped" position, grooved trip ring around reset button is exposed, indicating that circuit is broken. To restore service, simply press reset button all the way in until actuating element is again engaged with latching plates, then release. This brings contacts together again, remaking the circuit and preloading the return spring at the same time.

Putty-Like Electrical Insulating Compound

C-3 MINNESOTA MINING AND MANUFACTURING CO., 900 Fauquier St., St. Paul, Minn., has announced a new putty-like electrical insulating compound that comes in a convenient roll and applies like tape.

Designated "Scotchfil" brand electrical insulation putty, the black, ⅛-inch-thick material fuses into a void-free mass after application. It is designed not only to insulate, but also to pad sharp edges as on bus bars, build up cable splices, and fill voids around irregular-shaped connectors quickly and conveniently prior to taping.

Since it comes in roll form, it is necessary to use only as much as is needed for the job, and the rest of the

(*Continued on page 10*)

"WE REDUCED FUEL BILLS... ON CONVERSION TO A... *RAY OIL BURNER!*"

W. S. LANE, ENGINEER
FRANCIS MARION
HOTEL
CHARLESTON, S. C.

FRANCIS MARION HOTEL

Charleston, South Carolina

Ray Oil Burner Company
1301 San Jose Avenue
San Francisco 12, California

September 11, 1952

Attention: Mr. Beard

Dear Sir:

Mr. Malone of the Industrial Equipment Company, Orlando, Florida, requested me to send you these pictures of the Boilers and Ray Burners they installed in the Francis Marion Hotel at Charleston, S. C. last December.

I have been operating these Boilers now for nine months, using oil, and although it is the first experience I have had with oil fired boilers, I operated the boilers in this hotel for 27 years with stokers and hand firing.

There just are not any words that would express my opinion on the difference in operation, to say nothing about the saving in cost.

Before and after these new Boilers and Burners were installed, I went around to the other plants that were using oil in and around the city.

I was particularly interested in finding out what troubles they were having and about what I could expect to encounter when we converted to oil.

Now, after operating the oil fired Boilers for nine months, I can truthfully say that not one thing has gone wrong, and none of the troubles that the other plant engineers said were bound to happen, and to them were taken as normal, have occurred with my Burners. After nine months of experience, I can only say to the other engineers operating plants such as our hotel, that they should have bought a Ray Burner.

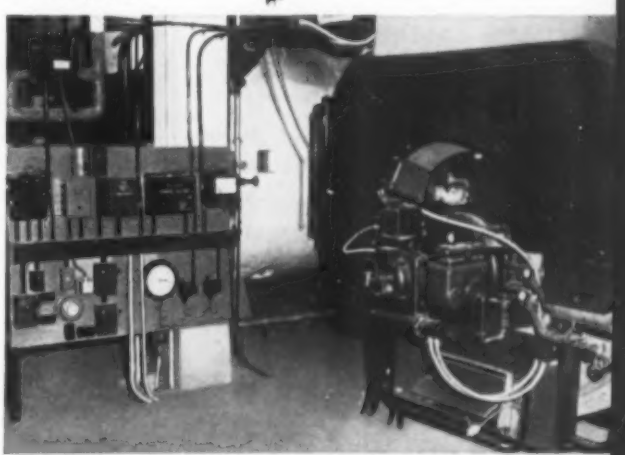
The following will give you some idea of the savings in dollars and cents, using three years of coal firing for a comparison.

Cost of coal for 1949	$10,443.78
Cost of coal for 1950	9,764.32
Cost of coal for 1951	11,219.89
Cost of oil for nine months in 1952	5,655.00

With figures such as these it is a waste of words to say that the Management, as well as myself, is greatly pleased with the change over to oil, and we wish to thank Newcomb and Boyd, consulting Engineers of Atlanta, Georgia, and the Industrial Equipment Company of Orlando, Florida for a job well done.

W. S. Lane

W. S. Lane, Engineer
Francis Marion Hotel
Charleston, S. C.



View of Boiler Room showing control panel and Ray Burner

A reliable installation by men of proven ability is the most important consideration in *heating*. And the installation of a *Ray Oil Burner* further assures you of low operating expense and trouble free service. Call on us for your next heating, steam or combustion problem . . . with assurance . . . whether it be oil, gas or gas-oil fired. . . .

YOUR AUTHORIZED RAY DISTRIBUTOR
OIL, GAS & GAS-OIL COMBINATION BURNERS

Industrial Equipment Company

Orlando, Fla.	Thomasville, Ga.	Atlanta Division
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Phone 3-7696	Phone 840	Phone EVergreen 1058

roll is protected by a disposable liner. As the material is used, the liner is stripped off, and the insulating putty is molded into place with the fingers, providing a smooth, non-sticky, easy-to-tape surface that does not smear or come off on the hands.

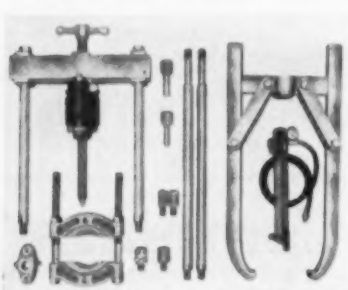
Scotchfil electrical insulation putty comes in a roll and applies like tape.

It is used with "Scotch" brand plastic electrical tapes since the backing and adhesive of these tapes form an inseparable bond with the material, adding to the mechanical strength of the splice. It has a dielectric strength of 350 volts per mil, and insulation resistance of 100,000 megohms, and will not corrode copper or silver. Available through electrical wholesalers, it comes in rolls 1½ in. wide and 5 ft long.

Industrial Puller Set

C-4 Owatonna Tool Co., 395 Cedar St., Owatonna, Mich., has introduced a new giant 50-ton industrial puller set, developed especially for industrial pulling and installing maintenance operations involving the removal and installation of gears, bearings, pulleys, wheels, pinions, shafts, etc., on machine tools, turbines, large dirt removing equipment, mining machines, and marine engines.

The set includes the new 50-ton Power-Twin Hydraulic Unit to provide the power, together with suitable pullers and attachments. A three speed hand pump or an electrically driven pump is also available for use with this set to speed up these jobs even more.

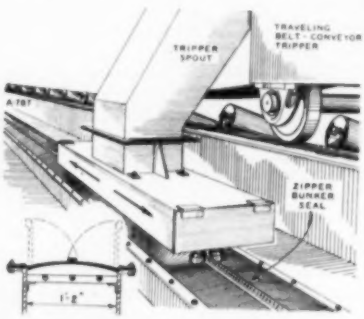


Owatonna's new 50-ton Power-Twin Hydraulic Unit.

Dust Control System For Coal Bunkers

C-5 Stephens - Adamson Mfg. Co., Aurora, Ill., has introduced the S-A Zipper Bunker Seal, designed to prevent dust from belt conveyor traveling tripper discharge spouts feeding bunkers.

The device consists of two zipper toothed seal belt strips and an opening and closing mechanism. The seal is designed primarily for power plant coal systems, but is equally effective in mining, chemical and other industries where traveling trippers are used.



Stephens-Adamson's inexpensive method for a dust-free boiler house. Sketch shows the method by which the two hinged rubber strips are opened and then meshed together in closed position to form a perfect dust tight seal across the 14 in. wide tripper discharge opening slot over the bunker. Operation is completely automatic.

Flat belts are fastened to opposite edges of the bunker opening, their zipper toothed edges meshing tightly along the centerline to form a dust-proof connection. The reversible belt operating mechanism hangs from the tripper spout, with rollers at each end spreading the teeth for easy opening or closing, depending on the direction of travel. Rollers are mounted on pantograph frames to maintain proper belt contact at all times. Since the belt is open only directly under the discharge point, dust cannot escape. A metal shield on the tripper chute completes the seal. Additional horsepower required to operate the Zipper Bunker Seal is less than .2 for typical tripper speeds. Grate bars under the seal belts protect the operator from accidental injury caused by stepping on or through the belts.

Print Filing Cabinet

C-6 Empire Development Corporation, 15 Park Row, New York 38, N. Y., has developed the Draw-In-Dex cabinet for filing blue prints, etc., safely, neatly, and conveniently without wrinkles, creases or curled edges.

Cabinet accommodates 1,250 prints. Each print hangs smoothly, and an index file locates prints instantly. Suspension rods support the drawings that are very easily attached to manila hangers. When the front panel is opened, any drawing may be immediately filed or removed. Special aluminum hanger design permits filing a large number of drawings together.

Shaft Mounted Speed Reducers

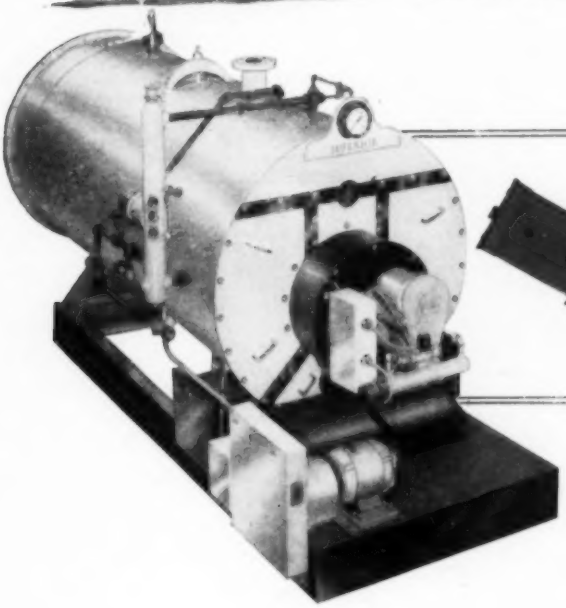
C-7 The American Pulley Company, 4200 Wissahickon Avenue, Philadelphia 29, Pennsylvania, announce a new series of 20:1 ratio speed-reduction units featuring important improvements in gears, bearings, housing, lubrication and oil sealing systems.

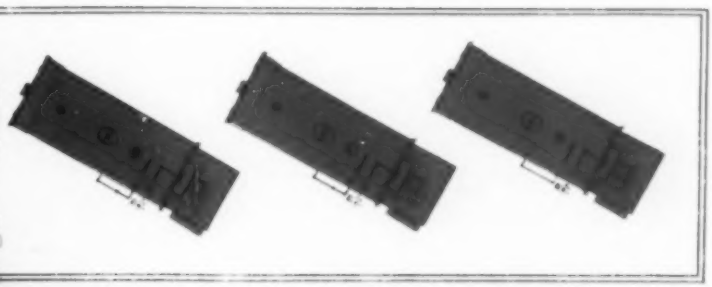
The new units represent the most advanced design in shaft-mounted speed reducers since they were first introduced twelve years ago. Gearing in "Shaft-King" speed reducers consists of two trains of the single-helical type.

An exclusive feature of construction is the use of both ball bearings and tapered-roller bearings, where each can be utilized most effectively. Longer bearing and gear life is made

(*Continued on page* 143)

this is the plant . . .





Unusually compact arrangement allowed for the installation of all three units in a boiler room only 20' x 60'

. . . . where 3 SUPERIOR STEAM GENERATORS saved more than their cost in less than 2 years

Only four years ago, this plant was inadequately heated with coal at a fuel cost (excluding labor) of approximately $44,000. per year. Three years ago, three Superior Steam Generators were installed with the following three results:

(1) Fuel costs were cut to $22,000 . . . and in less than two years, those Superior Steam Generators saved their total cost.

(2) The ability of those Superior Steam Generators to deliver their full rated capacities provided steam in excess of that required for heating . . . which was sold as process steam to further reduce the cost of operation.

(3) Because of their compact design, a substantial saving in space resulted; and the space thus saved was profitably rented to still further reduce the cost of operation.

To meet increased demands for process steam, a fourth Superior Steam Generator has recently been installed.

This is but one of the many case studies which demonstrate the advisability of investigating the installation of Superior Steam Generators in your plant. For complete details write for Catalog 511.

Superior Steam Generators are fully automatic; burn oil, gas, or both. 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR STEAM GENERATORS

WORTHINGTON

POINTERS ON PUMPS

Prepared for Industry by Worthington Pump and Machinery Corporation

A Plan That Gets the Most out of Centrifugal Pumps

Easy-To-Install Maintenance Program Means Better Performance, Longer Life

You can't get maximum production when your equipment's operation is constantly interrupted due to breakdowns. Moreover, today's equipment shortages make it increasingly more important that you get all the life you can out of your present machines.

We'd like to suggest a maintenance plan that will help you get the most out of one of your most vital pieces of equipment—centrifugal pumps.

Keep Informative Records

If you haven't already done so, it's a good idea to begin your maintenance plan by setting up a card index file so that you can catalogue each pump in your plant. Each card should contain the following information: plant pump number, size, manufacturer's name and style, serial number, date installed, and any other data which will help you to rapidly locate repair parts lists and manufacturer's parts numbers.

The rest of the card can be divided into a number of columns: Repair Date, Part Affected, Remarks, and Cost. A typical card is shown here.

PUMP MAINTENANCE CARD

_____PUMP NO.	_____MANUFACTURER
_____SIZE	_____MFGR'S ADDRESS
_____DATE INSTALLED	_____MFGR'S SERIAL NO.
_____LOCATION	_____MFGR'S STYLE

DATE	PART	REMARKS	COST

If you're careful to enter every maintenance or repair operation on the proper card, it won't be long before each card indicates a particular pattern of maintenance.

Set Up A Maintenance Schedule

Once this pattern is established for all the cards, you can set up a schedule of maintenance points for such items as: packing, greasing or oiling, painting, gasket replacement, and bearing examination. You may find, for example, that a unit or group requires packing maintenance about once every three months, and greasing once every four to six months, etc.

Your next step is to arrange a plant schedule so that a particular pump may be shut down for maintenance at or before these times. Thus you make it possible to do the maintenance work under proper and unhurried conditions to assure maximum conformity of production consistent with long pump life. In addition, examination of the card catalogue will guide operating and maintenance personnel as to quantity of repair parts they should keep on hand.

Make Periodic Inspections Externally

It is considered *inadvisable* to open pumps for inspection.

Rather, recent practice is to let pumps stay on the line until such time as external symptoms indicate overhaul may be required. These symptoms involve either a reduction in effective capacity because of wear at the internal clearance points or mechanical difficulties, such as vibration or noisy operation.

Parts requiring most frequent replacement in centrifugal pumps are: wearing rings, shaft sleeves, packing and bearings.

The most important maintenance point on process pumping equipment is the stuffing box. It must be kept clean, cool, and lubricated—but *packing* is the crucial operation. A good packing method will be discussed in a later edition of *Pointers on Pumps*.

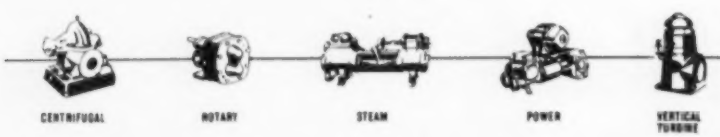
Don't forget the frames, base plates, and supporting parts of your pumps. Good housekeeping often makes it easier to do a good overall maintenance job!

Can We Help You?

Worthington makes more *standard* pumps than any other manufacturer. Don't buy a "special" (at a higher price) without checking to see if Worthington makes it *standard*.

If you *do* need a special, remember Worthington's modern engineering facilities, backed by the longest and broadest experience in the field. Contact our nearest District Office or write to Worthington Corporation, Centrifugal Pump Division, Harrison, N. J.

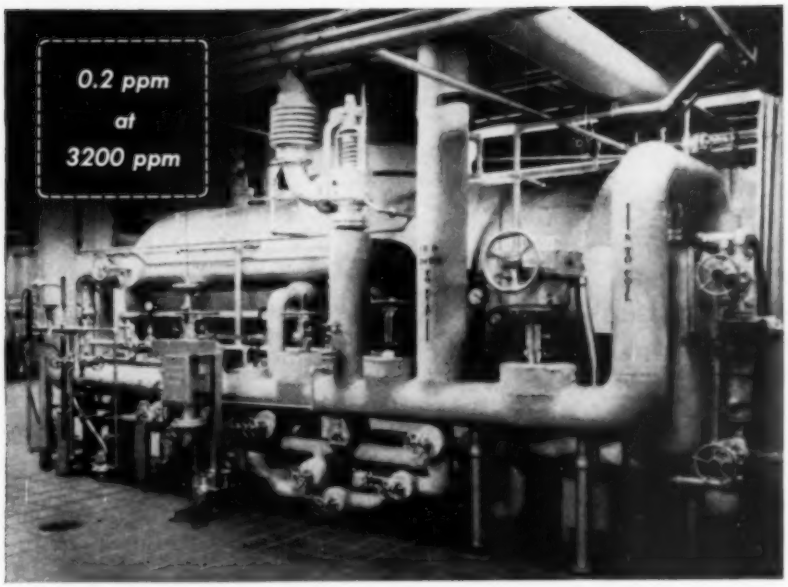
C.2.2



The World's Broadest Line Assures You the Right Pump for Every Job

WORTHINGTON

Centrifugal Pumps



INSTALLATION: (upper photo) Sunbury Steam Electric Station, Pennsylvania Power & Light Company.

EQUIPMENT: Three Lummus Bubble Tray Evaporators.

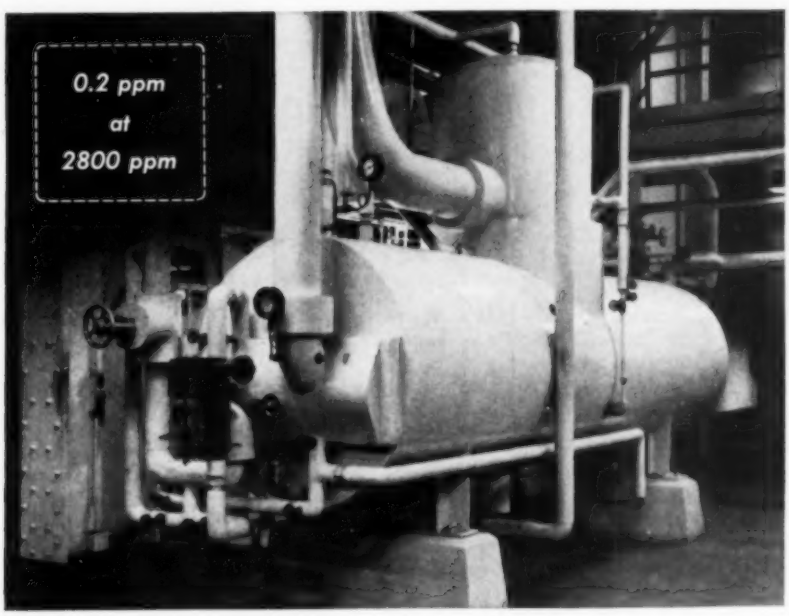
TEST RESULTS: Vapor product solids content 0.2 ppm at 3200 ppm shell concentration. In these tests, favorable purity was maintained up to 50% *over* design capacity (a capacity that wouldn't vary if load went down to only 25% *of* design).

INSTALLATION: (lower photo) Russell Station, Rochester Gas and Electric Company.

EQUIPMENT: Lummus Bubble Tray Evaporator.

TEST RESULTS: Vapor purity not above 0.2 ppm solids content at average 2800 ppm shell concentration. This highly remarkable purity remained stable at loads varying from 10% overcapacity down to 25% of design throughput.

These tests prove evaporation sets the standards for vapor purity

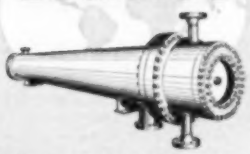


And here are more Lummus accomplishments—at Carolina Power & Light Company's Lumberton Station

- Lummus evaporators originally installed at Lumberton showed 0.2 ppm vapor purity in customer-conducted tests.
- Lummus was chosen to furnish the condenser and low pressure heaters at the new, modern, Lumberton #3 Unit.
- Highlight of the Lumberton #3 project was erection of the condenser by Lummus in only *31 days!*

Lummus performance at Sunbury, Rochester, Lumberton, and in many other installations, shows what's available to you in *plus-performance* when you specify Lummus equipment for your heat exchanger requirements.

LUMMUS



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THE LUMMUS COMPANY

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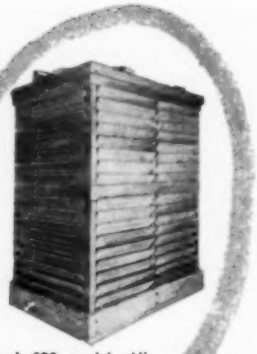
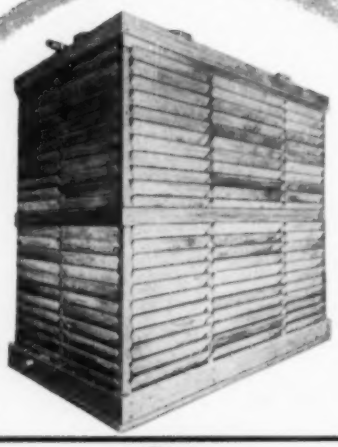
"Get the tower that's guaranteed"

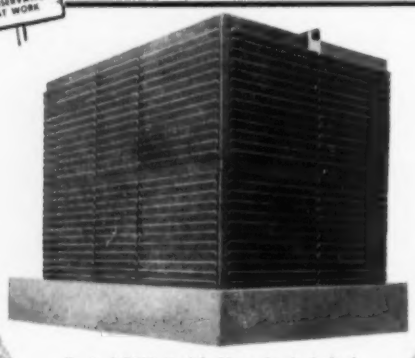


Typical SR8 model. All SR8 and SR10 models include steel basin.



Typical SR10 Model. All Lumber in COTOSPRAY® Towers is selected All Heart Redwood.

WATER CONSERVATION AT WORK



Typical SR12 Model. Note simple bolted assembly with louvers that lift out for easy access to interior.

Pritchard COTOSPRAY®

Quality Cooling Towers

All Pritchard COTOSPRAY® Cooling Towers are unconditionally guaranteed to deliver rated thermal capacity for the nominal life of the tower!

This guarantee is proof of Pritchard quality . . . based on more than a quarter of a century of proven field experience.

COTOSPRAY® Towers are universally accepted by industry for water cooling requirements encountered in refrigeration, air conditioning, engine jacket water cooling, steam condensers, quench oil cooling and other applications.

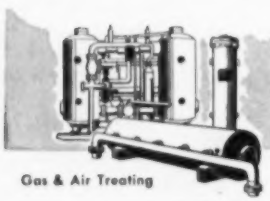
COTOSPRAY® Towers Offer You Greater Efficiency at Less Cost

Pritchard offers you a complete line of COTOSPRAY® Cooling Towers, available either as standard spray towers or with coil systems in basin for closed system cooling of liquids or gases. Each tower is designed for a specific application, with resulting higher operating efficiency.

Investigate Pritchard COTOSPRAY® Cooling Towers today! For complete detailed information, including specifications and capacity tables, write for bulletin 5.9.083.

CHECK ALL THESE COTOSPRAY® FEATURES:

- ✔ Lowest cost per unit of cooling.
- ✔ Simple field assembly — complete instructions furnished.
- ✔ Non-clogging, bronze spray nozzles.
- ✔ 3 to 330 tons capacity.
- ✔ Steel pipe distribution system.
- ✔ Long life assured—all redwood parts made of carefully selected, All Heart Redwood.
- ✔ Shipped complete—no accessories to purchase.



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Cooling Towers

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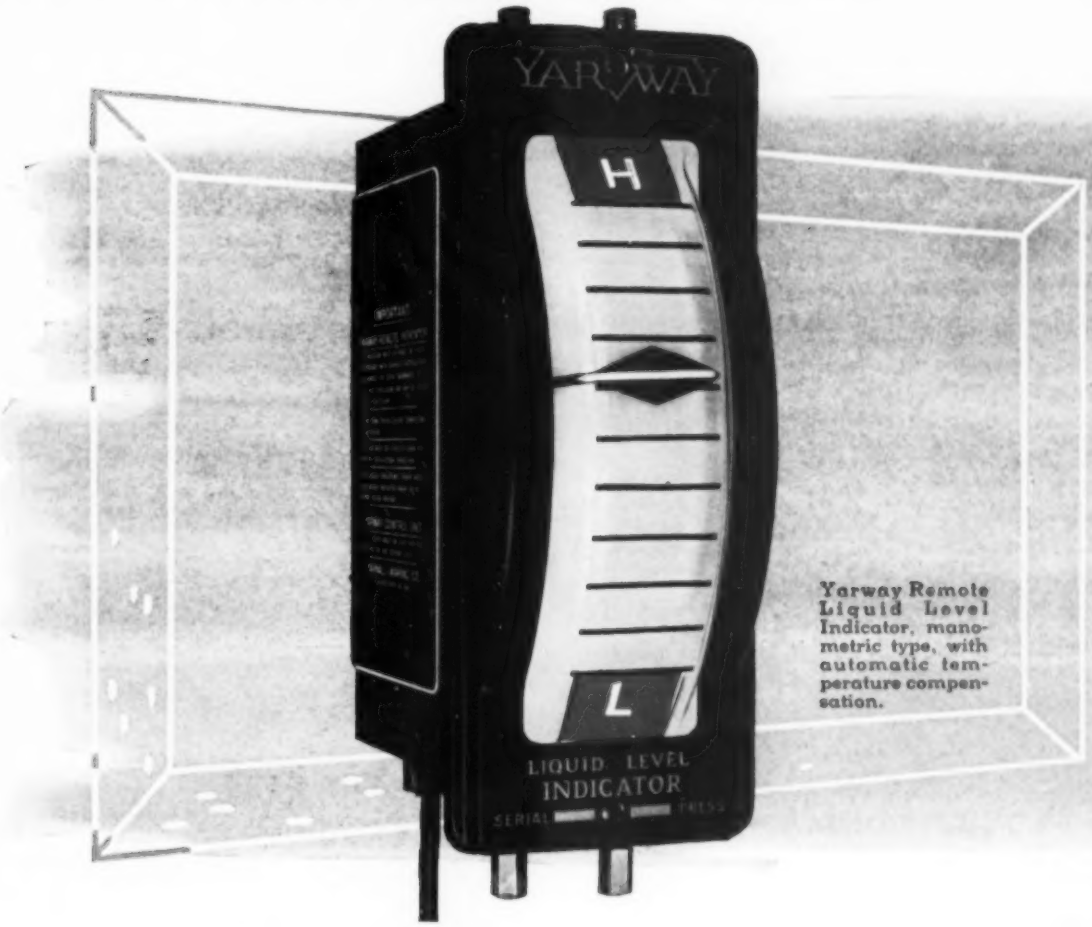
What's New
IN BOILER WATER LEVEL INDICATION?



Yarway Remote Liquid Level Indicator, manometric type, with automatic temperature compensation.

IMPROVED *WIDE VISION* REMOTE LIQUID LEVEL INDICATOR

A new-type face on the Yarway Remote Liquid Level Indicator now permits side as well as head-on dial readings. This vastly improved visibility makes it possible to check boiler water levels from most any position in the control room, or wherever the Yarway Remote Indicator may be installed.

MANOMETRIC TYPE

The Yarway Indicator is a manometric type with automatic temperature compensation. Level readings are instant and accurate because the indicator is operated by the boiler water itself. The indicating mechanism is never under pressure. There are no stuffing boxes.

Over 8,000 Yarway Remote Liquid Level Indicators are successfully operating throughout industry—primarily for indicating boiler water levels, but also for many other liquid level applications, and for superheater pressure differential indication aboard ship.

For full information on Yarway Indicators, write for Yarway Bulletin WG-1823.

YARNALL-WARING COMPANY *Home Office:* 116 Mermaid Ave., Philadelphia 18, Pa.

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22 **SPREADER STOKER**—Bulletin 80 describes an improved type of spreader stoker featuring a forward moving grate that slowly and continuously discharges the ash at the front, with fuel fed to the furnace by overthrow rotors to give uniform fuel distribution. — DETROIT STOKER CO.

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27 **MULTI-STAGE STEAM TURBINES** —Catalog 4200-A, 24 pages—Describes DeLaval mechanical drive multi-stage steam turbines up to 20,000 hp, and turbine generators up to 11,500 kw.—Lists basic types available, governor diagrams, design features, use of byproduct power.—DeLAVAL STEAM TURBINE CO.

30 **STEAM GENERATORS** — Catalog 1218—Describes packaged units 15 to 500 hp. Gives construction details of models for single or multiple fuel firing.—ORR & SEMBOWER, INC.

35 **UNIT STEAM BOILERS** — Catalog AD-100 — Gives complete information on "Self-Contained" boilers, 15 to 500 H.P., 15 to 250 psi for processing and for heating. Gives features, applications, efficiency, capacities and dimensions.—CLEAVER-BROOKS CO.

37 **OVERFEED STOKERS** — Bulletin "Efficient Combustion of Low Cost Fuels" describes satisfactory results attained through the use of Fyr-Feeder equipment in the burning of wood chips, sawdust and low price sizes and quality of coal. Engineering advice without obligation. — AMERICAN COAL BURNER CO., FYR-FEEDER ENGINEERS DIV.

38 **STEAM GENERATORS** — Bulletin SP-2—with photographs, cut-aways and typical boiler room layouts—describes Amesteam generators for oil or gas firing, from 10 to 600 hp, 15 to 200 lb steam pressure.—AMES IRON WORKS, INC.

39 **BOILER-BURNER UNIT** — A.I.A. File No. 34-B 1, 12 pages—Illustrates and describes the Kewanee-Iron Fireman Boiler-Burner Unit for high or low pressure heating, power and process steam, with oil, gas or oil-gas combination —design, industrial applications, engineering data.—IRON FIREMAN MANUFACTURING CO.

61 **STEAM GENERATORS** — Booklet 211—Describes the features of Superior steam generators—automatic operation, simple installation, induced draft without expensive chimney, clean, quiet operation, dry steam, seventeen sizes from 20 to 500 bhp, from 15 to 200 psi.—SUPERIOR COMBUSTION INDUSTRIES, INC.

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117 **EXHAUST FANS** — Bulletin 484—Describes how exhaust fans, direct driven and belt driven, cut fatigue loss in factory and office, and increase production.—THE EMERSON ELECTRIC MFG. CO.

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132 **FANS AND AIR CONDITIONING UNITS** — Manual, 68 pages—Contains valuable information applicable to virtually any type of fan job. Details and illustrations concerning various applications and installations.—CLARAGE FAN COMPANY.

155 **PROPORTIONING PUMPS**—Bulletin 52—Contains data on chemical feed packaged units made up of sturdy steel storage tank and high pressure low capacity proportioning pump—application and specification data.—THE BIRD-ARCHER COMPANY.

162 **AIR COOLED HEAT EXCHANGERS**—Bulletin 11.0.080 describes the new "Quintair" air cooled heat exchanger of revolutionary design for dependable, efficient cooling or condensing of steam or process vapors, natural gas, lubricating oil, quenching baths, jacket water, etc.—J. F. PRITCHARD & CO.

180 **ROTARY PUMPS**—Catalog LG—Brief descriptions and cross-sections of six DeLaval IMO—DeLaval rotary pumps, capacities to 1000 gpm at pressures to 500 psig, and to 150 gpm at 1500 psig—for pumping fuel oil, unloading and transferring oil, handling liquids for various power and industrial plant service.—DeLAVAL STEAM TURBINE CO.

190 **CENTRIFUGAL PUMPS** — Bulletin 1 gives a condensed listing of all types of centrifugal pumps for every service, including capacity, pressure and head range for each type. A quick reference on centrifugal pumps from A to Z.—PACIFIC PUMPS, INC.

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216 **PNEUMATIC PRESSURE TRANSMITTER**—Bulletin—Describes the Ashcroft transmitter and receiver gauge which use pneumatic means to transmit pressure measurements from their source to a central point.—MANNING, MAXWELL & MOORE, INC.

231 **PRESSURE REDUCING VALVES** —Bulletin 477 illustrates and describes complete line of pressure reducing valves covering a controlled pressure range from 27 inches of mercury vacuum to 600 psig.—COPES-VULCAN DIV., CONTINENTAL FOUNDRY & MCH. CO.

243 **MULTI-POINTER GAGES**—Bulletin 163-B describes the latest developments in Bailey diaphragm-operated multi-pointer gages for measurement of pressure, draft or differential. Describes four casing styles available in sizes to accommodate from one to twelve units.—BAILEY METER CO.

257 **AUTOMATIC STEAM PRESSURE CONTROL**—Bulletin 462—Describes the Leslie pressure controller for supplying intermittent make-up to a low pressure system from a high pressure line—positive, faithful.—LESLIE COMPANY.

266 **INSTRUMENT AIR DRYERS** — Bulletin 16.0.080 describes new packaged "Hydryers" for the efficient drying of instrument air. May also be used to dry other gases for process control. Several models available.—J. F. PRITCHARD & CO.

289 **INSTRUMENT VALVES** — Data Unit—Illustrates and describes complete line of general use valves which simplify instrument piping and control systems, making time and cost savings through reducing threaded connections by combining units, nipples, reducers, elbows, tees, valves and drain valves in one space saving unit.—JERGUSON GAGE & VALVE CO.

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351 **STEEL GRATING AND TREADS**—Bulletin 2096 describes Blaw-Knox electroforged steel grating and treads, their advantages and typical successful applications. — GRATING DEPT., BLAW-KNOX DIV., BLAW- KNOX CO.

355 **PLANT COMMUNICATION SYSTEMS**—Catalog—Describes a new method of industrial and power plant communication, with a high and low level voice communication—public address, operational intercommunication and amplified party-line telephone are provided in one complete system.—GAI-TRONICS CORPORATION.

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391 **FLEXIBLE DUCT** — Specification Data Brochure—Describes Flexflyte, the aircraft type duct having minimum weight, maximum flexibility, temperature extremes (minus 100 F to plus 625 F) high plus or minus pressure, petroleum resistance, flame resistance.—FLEXIBLE TUBING CORPORATION.

PIPING, VALVES, FITTINGS STEAM SPECIALTIES, TRAPS

403 **VALVE OPERATORS, SPROCKET RIMS**—Bulletin SR—Describes and illustrates adjustable sprocket rims with chain guides, and other forms of Babbitt valve operators and controls.—BABBITT STEAM SPECIALTY CO.

404 **MALLEABLE PIPE UNIONS AND SPECIALS** — Catalog — Describes unions, union elbows, union tees, union flanges—with ground joint brass or all-iron seats. 300-lb, 250-lb and 150-lb pressures, AAR unions.—JEFFERSON UNION CO.

405 **INSTRUMENT VALVES** — Bulletin 491—Gives in detail the design features of Edward Fig. 863 drop forged steel instrument valves for orifice meters, regulators, instrument panels, gage lines, by-pass lines, corrosive lines, oil field applications—ratings of 6000 lb WOG at 100F or 1500 lb sp at 1000 F.—EDWARD VALVES, INC.

408 **SPRING HANGERS AND VIBRATIONAL ELIMINATORS**—Bulletin 2026 describes modern, original designs of functional spring hangers, and vibrational eliminators which permit engineers to correlate the design of power piping for flexibility. Engineering data as to proper method of installing supports, eliminate vibration, absorb shock and control movements—BLAW-KNOX CONSTRUCTION CO., POWER PIPING DIV.

419 **SPIRAL WELD PIPING**—Bulletin 493—Describes spiral weld pipe and related fittings for widespread convenient applications in all kinds of plants.—TAYLOR FORGE & PIPE WORKS.

434 **WROUGHT IRON FOR PIPING SYSTEMS**—Bulletin —Gives a fund of helpful information on piping materials and their selection—on corrosive conditions in water, drainage and heating systems, and on methods for reducing the severity of damage of corrosion.—A. M. BYERS CO.

438 **DRAINAGE TRAPS**—Catalog 444—Describes advanced trapping methods for solving drainage problems in your plant.—W. H. NICHOLSON & CO.

443 **REDUCING VALVES** — "Atlas Reducing Valve Data Book" — Gives complete information on Type "D" reducing valves of simple design, easy to inspect, adaptable, durable.—ATLAS VALVE CO.

466 **IRON VALVES**—Bulletin V-405—Concisely gives the general specifications of standard iron gate, globe and check valves, including valves approved by the Underwriters Laboratories for fire lines, and valves conforming to A.W.W.A. specifications.—THE FAIRBANKS COMPANY.

471 **COMPOUND TRAPS**—Bulletin No. 215, 8 pages—Describes purpose, operation, physical data, capacities, installation and prices of piston-operated compound traps, designed for use on equipment producing large amounts of condensate, such as separators, evaporators, purifiers, etc.—ARMSTRONG MACHINE WORKS.

495 **BOILER SERVICE VALVES**—Bulletin E135, 32 pages—Describes and illustrates boiler service valves, for surface blow-off, bottom blow-off, water column blow-off—specifications, materials of construction, dimensions of each type.—EVERLASTING VALVE CO.

MAINTENANCE PACKING GASKETS, LUBRICATION

515 **INDUSTRIAL VACUUM CLEANING**—Booklet A-766, 4 pages—Describes the wide application of Hoffman heavy duty portable and stationary industrial vacuum cleaning systems in increasing production, improving quality, reducing maintenance costs and promoting better plant safety, cleanliness and morale.—U. S. HOFFMAN MACHINERY CORP., AIR APPLIANCE DIVISION.

520 **PACKING**—RM Packing Catalog—Describes Pyroid compressed asbestos sheet packing, also other types of packing, rubber and composition, to cover many plant applications.—RAYBESTOS-MANHATTAN, INC.

524 **BRONZE BEARINGS** — Catalog 46—Gives complete specifications of standard stock bearings for miscellaneous applications, for electric motors — and of tubular and solid bronze bars available in stock.—THE BUNTING BRASS & BRONZE CO.

528 **INDUSTRIAL PRODUCTS**—Bulletin GI-6A, 40 pages—Describes J-M industrial products intended to save industry millions of dollars every year—insulations, refractory products, asbestos-cement pipe, packings and gaskets, electrical products, friction materials, roofing and siding, flooring, partitions and ceilings.—JOHNS-MANVILLE SALES CORPORATION.

529 **RUST PREVENTIVE** — Booklet — Describes a simple, positive process and treatment for cleaning and protecting rusted surfaces or those subject to rust—protecting against water, rain, snow, fumes, heat, weathering—in doors or out.—RUST-OLEUM CORP.

557 **PIPE CLEANING** — Booklet — Describes proven methods of cleaning pipes, ducts, conduits and other important water and liquid channels in plants and utility systems—to materially increase capacity and efficiency. Proven specialists in this field show successful methods.—ACE PIPE CLEANING CONTRACTORS, INC.

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575 **LUBRICATION**—Data Book T-52, 56 pages—Describes the Lubriplate line of specialized lubricants in various types of fluids and greases for diversified industrial and power applications, with tables of recommendations for specific equipment used in different industries.—FISKE BROTHERS REFINING CO., Lubriplate Division.

ENGINES, DRIVES POWER TRANSMISSION MATERIALS HANDLING

603 **OVERHEAD HANDLING**—Bulletin C-1, 56 pages, contains hundreds of views showing how American Monorail equipment solves overhead handling problems.—AMERICAN MONORAIL CO.

611 **BELT CONVEYORS**—Catalog ID-451—Describes Continental belt conveyors featuring standard and special idlers and many convenient accessories for application in materials handling.—CONTINENTAL GIN CO.

634 **BULK CONVEYORS**—Book 2175—Describes many applications of the flexible Bulk-Flo conveyor, an economic means for handling free-flowing, granular, crushed, ground or pulverized material.—LINK-BELT CO.

693 **ADJUSTABLE VARIABLE SPEED DRIVES** — Condensed Catalog No. 168T—For engineers and salesmen in making estimates on speed control for any machine or process. Prices, dimensions, applications for ¼ hp to 35 hp motors, en-

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2-53-1

Please send me without obligation, free booklets described in the February, 1953, issue of SOUTHERN POWER AND INDUSTRY as circled below:

9	22	24	27	30	35	37	38	39	61	83	85	92	117	124	132
155	162	180	190	214	216	231	243	257	266	289	300	336	341	351	385
364	366	391	403	404	405	408	419	434	438	443	466	471	498	515	520
524	528	529	557	564	575	603	611	634	693	713	721	740	786	768	793
796	804	807	808	845	848	850	861	863	907	910	915	921	951	989	960
B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	524	B25
B26	B27	B28	B29	B30	B31	B32	B33	B34	B35	B36	B37	B38	B39	B40	

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closed, drip-proof standard or special mounted.—STERLING ELECTRIC MOTORS, INC.

WATER TREATMENT, HEATING, VENTILATING, AIR CONDITIONING, REFRIGERATION, DUST & FUME CONTROL

713 CORROSION PROTECTION OF STEAM AND CONDENSATE RETURN SYSTEM—Folder—Describes the recently developed Amine treatment which tends to prohibit corrosion of boiler and condensate systems by surface protection of the metal itself, while raising the pH value of the condensate.—THE BIRD-ARCHER COMPANY.

721 COOLING TOWER FANS—Bulletin 4.8.080A — Explains efficiency and illustrates construction of POWAir-SAVER fans for use in moving large volumes of air through cooling towers, heat exchangers, etc.—EQUIPMENT DIVISION, J. F. PRITCHARD & COMPANY.

740 ION EXCHANGERS—Bulletin 2508 —Describes Cation and Anion exchangers—states their application and explains the necessary equipment for application to industrial processing.—THE PERMUTIT CO.

756 HEATERS DEAERATORS AND HOT PROCESS SOFTENERS—Bulletin No. 103 describes the Belco exclusive atomizing valve available in capacities of 1 to 1,000 gpm. Belco open heaters, deaerators and hot process softeners are also illustrated and described.—BELCO INDUSTRIAL EQUIPMENT DIVISION.

768 STEAM HUMIDIFIER — Bulletin 1773 describes a complete line of steam humidifiers, including two new air controlled models. Discusses dry air problems, gives tables on desirable relative humidities and the regain of hygroscopic materials. Complete data on operation and installation. — ARMSTRONG MACHINE WORKS

793 COOLING TOWERS—Catalog 145—Describes C. H. Wheeler water cooling towers, designed to withstand wind velocities of 100 miles per hour—guaranteed performance with minimum water losses.—C. H. WHEELER MFG. CO.

796 WATER TREATMENT — Bulletin 51, 8 pages—Lists 94 Nalco products by number and describes briefly their composition and use—lists principal industries using such products and typical applications in these industries.—NATIONAL ALUMINATE CORP.

ELECTRICAL

804 CUBICLES, PANELS, ENCLOSURES—Descriptive Booket—"Contract Manufacturing in Sheet Metals"—Describes job-fitted control centers, bus enclosures, cubicles, switchgear housing and other sheet metal assemblies for utility and industrial plants.—THE KIRK & BLUM MFG. CO.

807 ELECTRONICS COMMUNICATION SYSTEM—Catalog—Describes a high and low level voice plant communication system—public address, operational intercommunication, amplified party-line telephone, all provided in one complete system. —GAI-TRONICS CORPORATION.

808 MOTORS, TRANSFORMERS, BRAKES—Form EU-2 is a pocket size data book, giving details and prices on motors, transformers and industrial brakes. —WAGNER ELECTRIC CORP.

845 CERAMIC CAPACITORS — Bulletins 601 and 603-A—Describe precision ceramic capacitors hermetically sealed in metal tubes, to greatly extend the capacitance range available to circuit designers, at rated voltages of 500, 1000 and 1500 volts D-C. This construction was pioneered originally by Sprague-Herlock, the Herlock Corporation being a wholly-owned subsidiary of Sprague.—SPRAGUE ELECTRIC COMPANY.

848 ELECTRIC MOTORS—Catalog, 20 pages — Describes the history of Sterling Electric Motor products, and gives details concerning design, applications and outstanding features.—STERLING ELECTRIC MOTORS CO.

850 MOTOR STARTERS—Bulletin 705—Describes A-B solenoid starters for electric motors, simple in construction, with double break, cadmium-silver contacts, to assure safe, reliable, trouble-free operation. —ALLEN-BRADLEY CO.

861 FUSETRONS—Booklet gives complete facts on Buss fusetrons—a combination fuse and thermal cut-out of low electrical resistance and high time lag—prevents shutdowns, saves maintenance costs.—BUSSMANN MFG. CO.

863 FLEXIBLE CORDS, PORTABLE CABLES — Bulletin H-420A—Gives complete technical and dimensional data on Hazacord tough, flexible, weather and flame resistant portable cables for services up to 15,000 volts.—THE OKONITE CO.

MISCELLANEOUS . . . SAFETY, BUILDING EQUIPMENT, METALS

907 SHEET METAL PANELS, CUBICLES, ETC.—Descriptive Booklet — "Contract Manufacturing in Sheet Metals" describes job-tailored control centers, bus enclosures, cubicles, switchgear housings, panel and various other sheet metal assemblies for utility and industrial plant applications.—THE KIRK & BLUM MFG. CO.

910 WELDING AND BRAZING ALUMINUM—A booklet, "Welding and Brazing Alcoa Aluminum"—Gives complete information on Tungsten-Argon welds, very successful in ever-increasing practice. Other types of welding and brazing aluminum.—ALUMINUM COMPANY OF AMERICA.

915 DUST AND FLY ASH COLLECTORS—Bulletins No. SC-11 and SC-13—Describe two types of highly efficient multiple cyclone dust and fly ash collectors for boiler plants and other industrial applications.—THE FLY ASH ARRESTOR CORPORATION.

921 VACUUM CLEANING—Form A-703, 16 page booklet, describes the greater plant cleanliness, safety and productivity gained through the use of Hoffman heavy duty vacuum cleaning. Applications and installations illustrated.—U. S. HOFFMAN MACHINERY CORP.

951 ENGINEERING SERVICES—Catalog 0.94.001, including a special equipment section, describes qualifications for designing, engineering and construction of plant and processing facilities for Chemical and Petroleum industries.—J. F. PRITCHARD & CO.

959 THERMAL INSULATION — Chart IN—6B, 11½" x 18", suitable for hanging on the wall, shows at a glance the recommended insulation for every temperature range from —400°F to plus 3000°F.—JOHNS-MANVILLE CORP.

980 UNIT HEATERS—Thermoflier Catalog—Describes the important features of Thermoflier unit heating, an economical method of adequate plant heating. —GRINNELL CO., INC.

Continued on page 154

3-53-2

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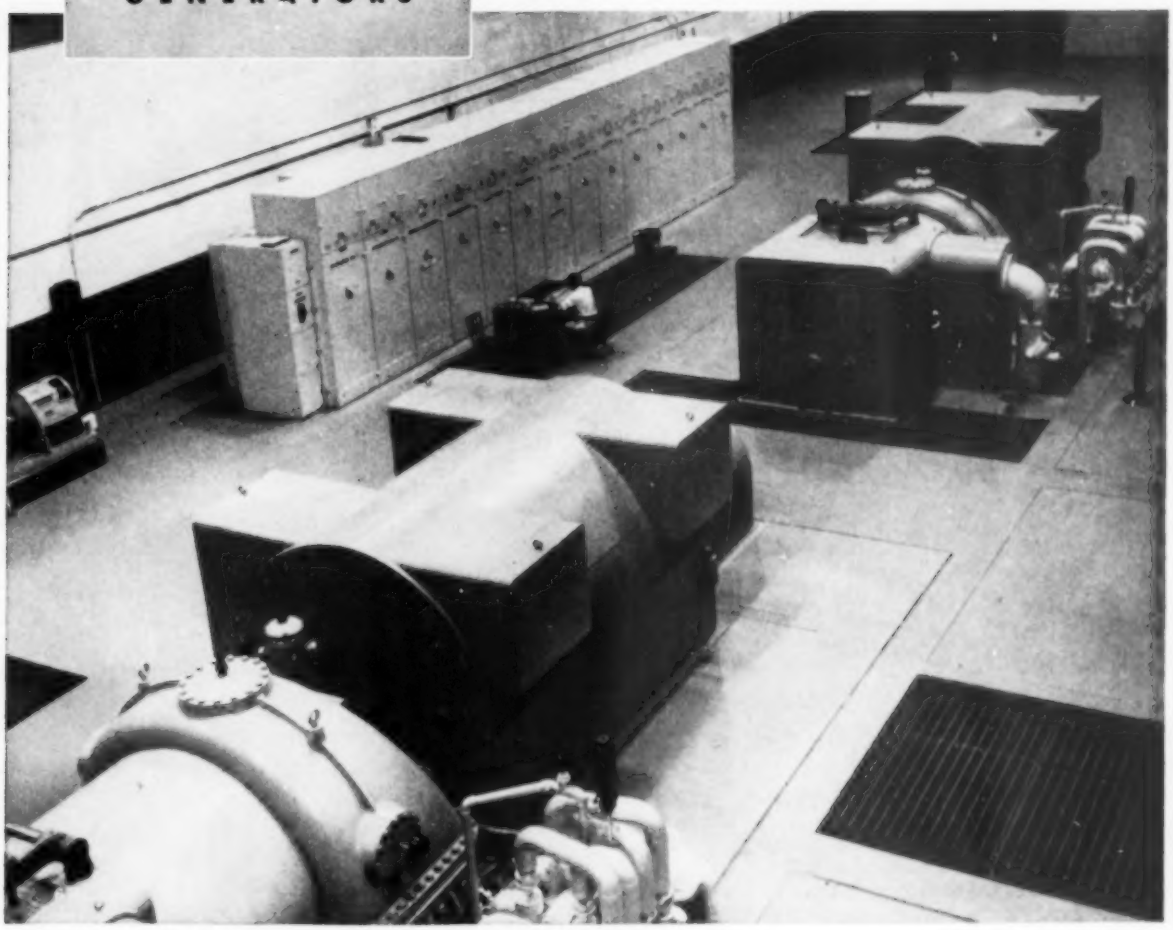
List Items You Want, Tear Out and Mail One of the Attached Cards Now!

Please be sure to fill in your Firm's Name and your position on the Coupon. This service cannot be extended to you unless this information is furnished.

DE LAVAL TURBINE GENERATORS

provide more power for Guam



De Laval furnished the Navy Department, Bureau of Yards and Docks, two 11,500 kw De Laval Turbine Generators to supplement power requirements for the island of Guam, headquarters for ship repairs and defense activities in the Pacific. These AIEE-ASME Standard Units operate at 600 psi, 825F. They have been on the job more than a year. Service record? Excellent.

More than a half century of experience lies behind modern De Laval Turbine Generators. In fact, the first unit of this type ever installed in America—in *1893*—had a De Laval nameplate. De Laval engineers are old hands at making turbines that are high on performance, low on maintenance.

You benefit by De Laval's quality design standards in a wide range of other power plant products—boiler feed pumps, IMO fuel oil pumps, circulating water pumps and condensate pumps. Consult your De Laval Engineer on your specific applications.

DE LAVAL *Turbine Generators*

DE LAVAL STEAM TURBINE COMPANY
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It's as simple as ABC!

For coal with maximum BTU's and lowest ash, your choice is simple: Bell & Zoller's *Superwashed* ORIOLE coal. It's a select industrial coal from the No. 11 seam in Western Kentucky, scientifically washed and prepared to meet your exact requirements, and shipped via rail or economical combined rail-inland waterway routes.

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lubricate with Gulf Harmony Oil

Sounds impossible, doesn't it? But, of course, we're referring to two special properties combined in Gulf Harmony Oil—two of the principal reasons why this quality lubricant is so ideally suited for bearing lubrication.

"Wet" means "Wet with oil," a job that's done better by Gulf Harmony Oil—thanks to exceptional oiliness characteristics.

"Dry" means free of moisture—Gulf Harmony Oil has effective "polar" properties, which keep moisture from contacting polished bearing surfaces—and prevent rust.

By keeping bearing surfaces both wet and dry, Gulf Harmony Oil does a better lubricating job. Ask a Gulf Sales Engineer for additional information on this outstanding lubricant. Write, wire, or phone your nearest Gulf office today.

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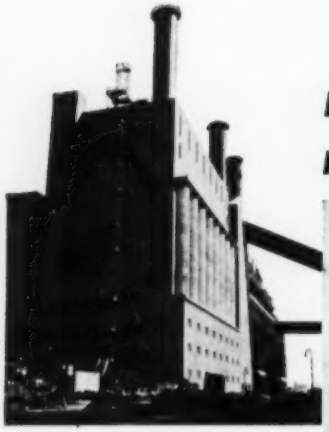
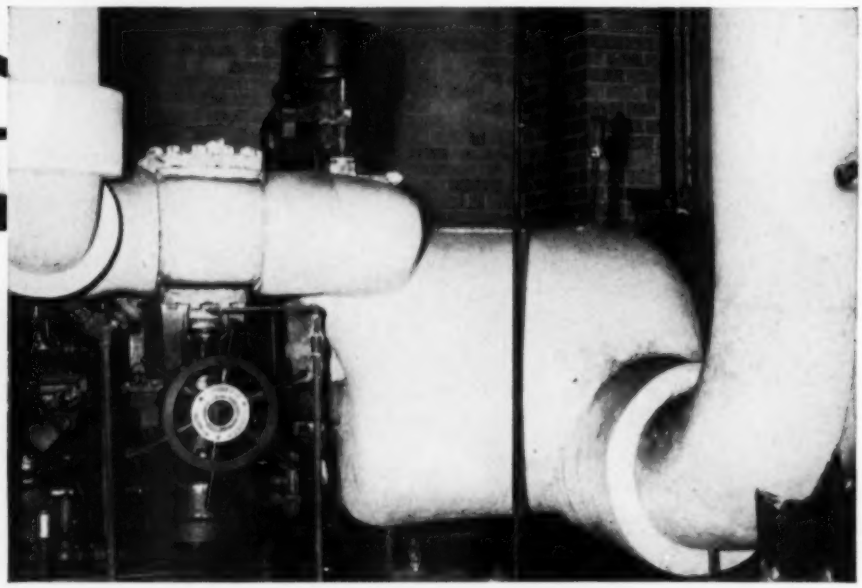
GULF INDUSTRIAL LUBRICATION



For this new addition to their New York City power plant at East River and 14th Street . . .



(Above) View of recently completed annex to Consolidated Edison's power plant . . . another link in their gigantic expansion program. **(Right)** Close-up of J-M 85% Magnesia Insulation on boiler feed lines. It was expertly installed by the Asbestos Construction Company, Inc., an outstanding J-M Insulation Contractor.

CON EDISON SPECIFIES J-M 85% MAGNESIA PIPE INSULATION FOR MAXIMUM FUEL SAVINGS

Like all materials that went into the new power plant addition of New York's leading gas and electric supplier . . . the pipe insulation had to be the *best*. That's why Consolidated Edison Co. specified J-M 85% Magnesia . . . industry's No. 1 insulation for many decades and *still* the leader in its class.

J-M 85% Magnesia is the leading insulation on the market for temperatures up to 600F. It is bonded with asbestos fibers. This rugged insulation will not distort regardless of the length of time it stays in service. J-M 85% Magnesia fits snug and stays put. Heat savings, therefore, remain constant for the life of the equipment on which this insulation is applied.

For temperatures over 600F, J-M 85% Magnesia is used in combination with Superex*, a J-M insulation for service to 1900F. This double-layer construction, known as Superex Combination, eliminates through joints and protects the jacket against scorching. It also utilizes the higher heat resistance of Superex next to the hot surface, and the greater insulating value of J-M 85% Magnesia for the outer layer.

Reg. U.S. Pat. Off.

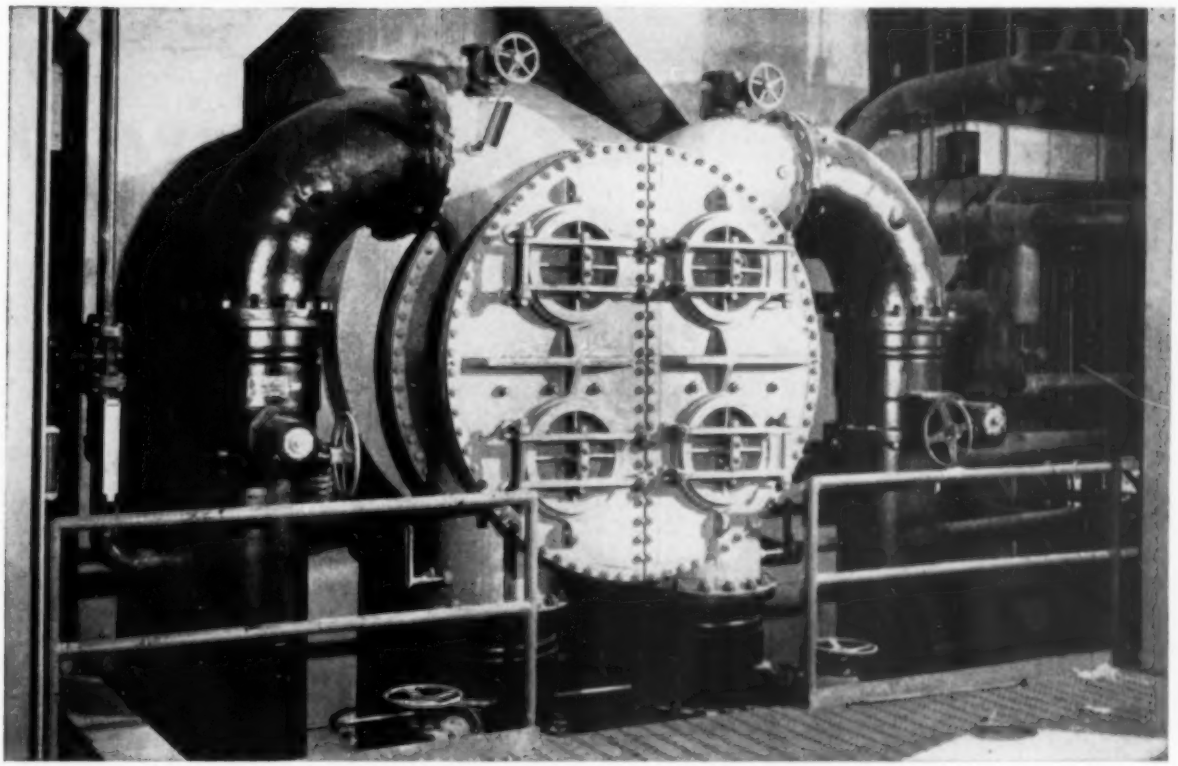
Experience has proved that all insulations must be properly installed to pay maximum dividends. That's why Johns-Manville offers industry the services of experienced insulation engineers and installation contractors who have made a career of solving complex insulation problems. From coast to coast, these engineers and the contractor's highly skilled mechanics stand ready to combine their talents and give you an insulation job that will more than pay off your initial investment with maximum fuel savings through the years.

When you face your next insulating problem . . . remember that Johns-Manville is "Insulation Headquarters." Consult your near-by J-M Insulation Contractor . . . or write direct to Johns-Manville, Box 60, New York 16, New York. In Canada, write 199 Bay Street, Toronto 1, Ontario.

Skilled Applicators on the team of a J-M Insulation Contractor applying J-M 85% Magnesia to pipelines. Located throughout the nation, these contractors have had years of experience handling all types of installations. They know J-M 85% Magnesia and other J-M insulations as *quality* products, and take pride in applying them properly. Result: an insulation job that pays dividends through the years in maximum fuel savings.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION



CONSECO 2-PASS CONDENSER

helps turn out low-cost power at Henderson, Kentucky Plant

Pictured above is the Conseco 6000 sq. ft. 2-pass, divided-flow condenser installed in the Municipal Power Plant of Henderson, Kentucky.

This Conseco unit handles a 5000 kw. turbine. Also installed in this modern municipal plant is a Conseco twin-element, two-stage air ejector & a single element, non-condensing hogging ejector.

WRITE for latest engineering bulletins on Conseco Condensers, Ejectors and other power plant equipment. They point the way to smoother plant operation and lower power cost.

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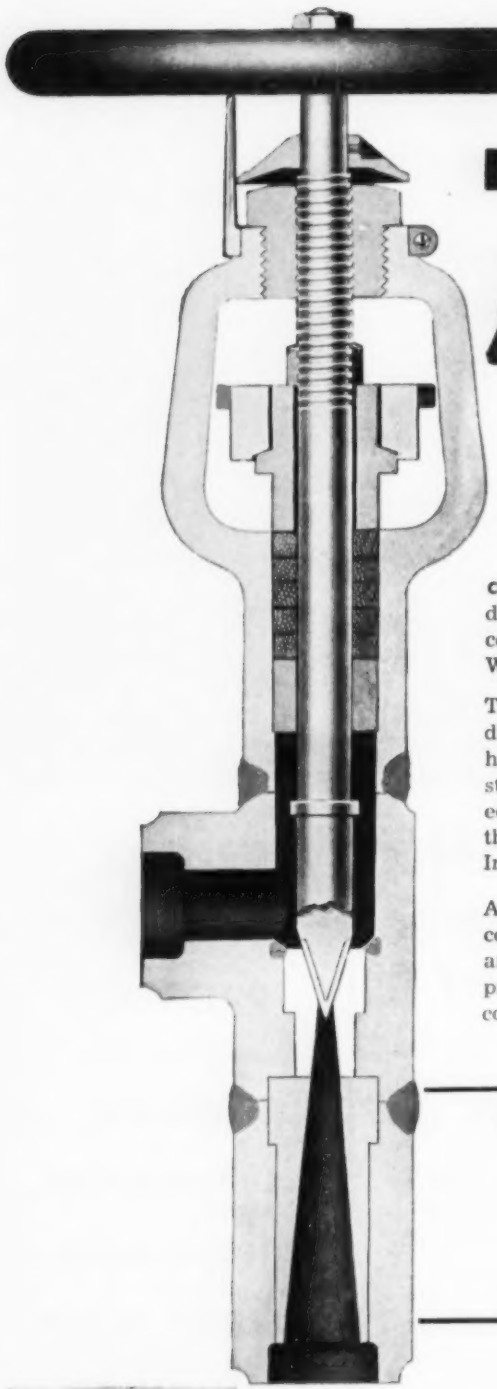


BUILT TO WITHSTAND *Flashing Steam...*

HANCOCK
HI-PRESSURE DROP
WELDVALVES

CONTINUOUS BLOWDOWN can wreck a conventional valve seat in a few days or weeks, regardless of pressure or temperature. Avoid the high cost of such quick destruction — specify Hancock Hi-Pressure Drop Weldvalves. They combine orifice, shut-off and index in a single unit.

The inlet of these blowdown valves is above the seat. The diverging delivery tube provides a rim for the flashing steam and compels the high-velocity stream of water to dissipate its force upon itself, instead of destroying the valve. This ingenious design assures long, economical life in continuous blowdown service. Because they are of the orifice type, you can use a smaller size valve with a large capacity. Intermediate capacities obtainable by adjusting the valve opening.

Ask for complete data on Hancock Hi-Pressure Drop Weldvalves for continuous blowdown systems. Also learn how these rugged valves are used on feed water pump bypass relief, in turbine washing processes, and in other services where corrosion is severe and conventional valves wear rapidly. Write or phone today.

HANCOCK HI-PRESSURE DROP WELDVALVES
NO BONNET JOINT DESIGN

Sizes: ¾", 1", 1½".
Orifice Sizes: Minimum ⅛" Maximum 1"
Pressures: 600 p.s.i. thru 2500 p.s.i.
Connections: Screwed or socket weld ends.
Seats: 500 Brinell Stainless Steel or Solid Stellite. Venturi throat silver brazed to the body.
Steam-Disc: Integral needle point—500 Brinell Stainless Steel or tipped with Stellite.

When Hancocks go in, valve costs go down.

HANCOCK VALVES

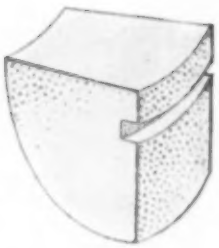
A product of **MANNING MAXWELL & MOORE, INC.** WATERTOWN 72, MASSACHUSETTS

MAKERS OF 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

B&W KAOCAST goes in more furnaces because...

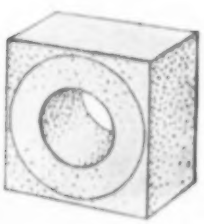
Versatile B&W Kaocast can be molded quickly and easily with your own labor. It can also be cast directly in place or applied with a cement gun. This unique 3000 degree refractory castable has high resistance to spalling and slag attack, low volume change and negligible reheat shrinkage. Consult a B&W Refractories Engineer on your specific applications and see how B&W Kaocast can save money for you.

It cuts inventory



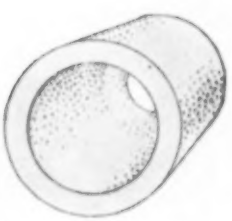
Nose arches for oil heaters were formerly made with special shapes of ordinary firebrick. Switching to quickly moldable Kaocast eliminated need for expensive special-shape inventory . . . minimized delays. In addition, side by side tests proved that Kaocast far outlasted the ordinary firebrick.

It speeds repairs



Kaocast was specified for the charging front of a forging furnace, used to heat heavy pipe ends. The reason? Kaocast linings were molded faster . . . give longer service, could be made when convenient and stored 'til needed.

It lasts longer



A chemical plant found that burner tile for a heating furnace made of an ordinary castable stood up only 3 to 4 months. But Kaocast burner tile stayed on the job 16 months and longer. Thousands of pounds of Kaocast have been used for this and many other applications in this plant.

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NOTES

for the engineer's note book

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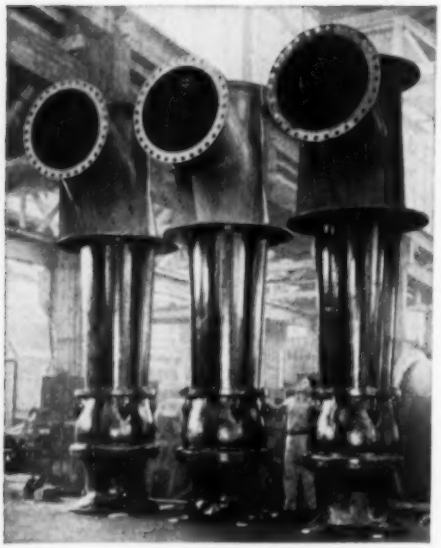
WHEELER-ECONOMY
POWER PLANT
EQUIPMENT



INCREASE OPERATING DEPENDABILITY WITH WHEELER-ECONOMY PUMPS

Wheeler-Economy Pumps Designed Particularly for Power Plant Application Include:

CIRCULATORS

Mixed Flow, Vertical Wet Pit, Standard and "Pull-Out" Types
Mixed Flow Volute, Dry Pit Type
Horizontal Double Suction

CONDENSATE PUMPS

Multi-Stage Horizontally Split Case
Vertical Barrel Type

36" mixed flow condenser cooling water circulating pumps (illustrated) ready for day-in day-out 24-hour service. These circulators have a capacity of 28,000 GPM at 45' head. Driven by 400 HP motors at 585 RPM. Circulators are offered in standard sizes from 1000 GPM to 100,000 GPM and may be furnished on special order for capacities up to 200,000 GPM.

Wheeler-Economy Pumps for General Service Power Plant Operation Include:

Single Stage High Head Double Suction; Multi-Stage Horizontally and Vertically Split Case; Process; Sump; Heating and Fire Service.

BE SURE OF PEAK PERFORMANCE WITH C. H. WHEELER CUSTOM-BUILT CONDENSERS

The thinking of C. H. Wheeler's experienced engineers is not confined to any standard or special type of condenser. They study all the conditions surrounding your requirements—such factors as source, quantity and quality of water supply, etc. The C. H. Wheeler Steam Condenser they subsequently recommend and design for you is, therefore, custom-built for every contingency that might arise. Initial cost is soon paid for and you enjoy the peace of mind that goes with sustained peak performance. Write for bulletin, "Self-Cleaning Steam Condensers with Reverse Flow."

GET MORE EFFICIENCY AT LOWER COST WITH C. H. WHEELER TUBEJETS

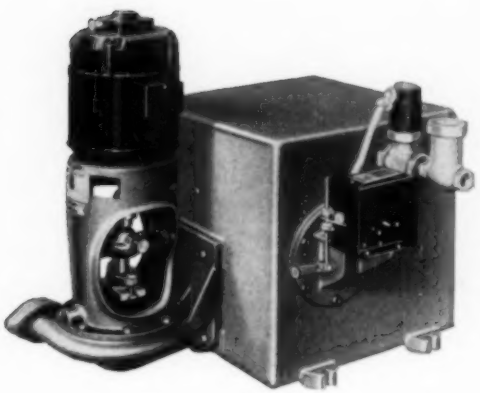
The C. H. Wheeler Manufacturing Company has been foremost in the development of steam jet ejectors, winning engineering awards and world-wide distinction in this field. The C. H. Wheeler Tubejet is a highly reliable vacuum pump. It is easy to install and maintenance costs are low. Long life is assured because the Tubejet has no moving parts. Tubejets are easily arranged in a variety of combinations of single or multi-stage units with inter- and after-condensers to meet all conditions. Write for CATALOG #1462.

C. H. WHEELER *of Philadelphia*

C. H. WHEELER MANUFACTURING CO., 19TH AND LEHIGH, PHILADELPHIA 32, PA.

Steam Condensers • Centrifugal, Axial and Mixed Flow Pumps • Steam Jet Ejectors • Cooling Towers • Vacuum Refrigeration
High Vacuum Process Equipment • Micro-Particle Reduction Mills • Marine Condensers and Ejectors • Deck Machinery

. . . ON
WHEELER-ECONOMY
HEATING PUMPS



SAVE COSTS IN HOT WATER OR STEAM HEATING

HOT WATER—Wheeler-Economy Hot Water Circulating Pumps can be furnished in a large range of types and capacities for economical, efficient use in panel, base board, radiant and all hot water heating systems.

STEAM—For steam heating systems, specify and use Wheeler-Economy Vacuum Pumps and Return Condensation Pumps to obtain top quality performance and reliability. You can count on an open system, free of condensate, at all times.

With Wheeler-Economy Heating Pumps on the job, savings in fuel, efficient BTU delivery and low maintenance pay you important dividends season after season. Our engineers and distributors will be glad to help you on pump specifications. Write for Bulletins on the extensive Wheeler-Economy Heating Pump line and location of nearest distributor.

(Note to Distributors: Some choice territories are still open.)

WHEELER-ECONOMY PUMPS
Division of C. H. Wheeler Mfg. Co.
Philadelphia 32, Pa.

. . . ON Klipfel
FLOAT VALVES

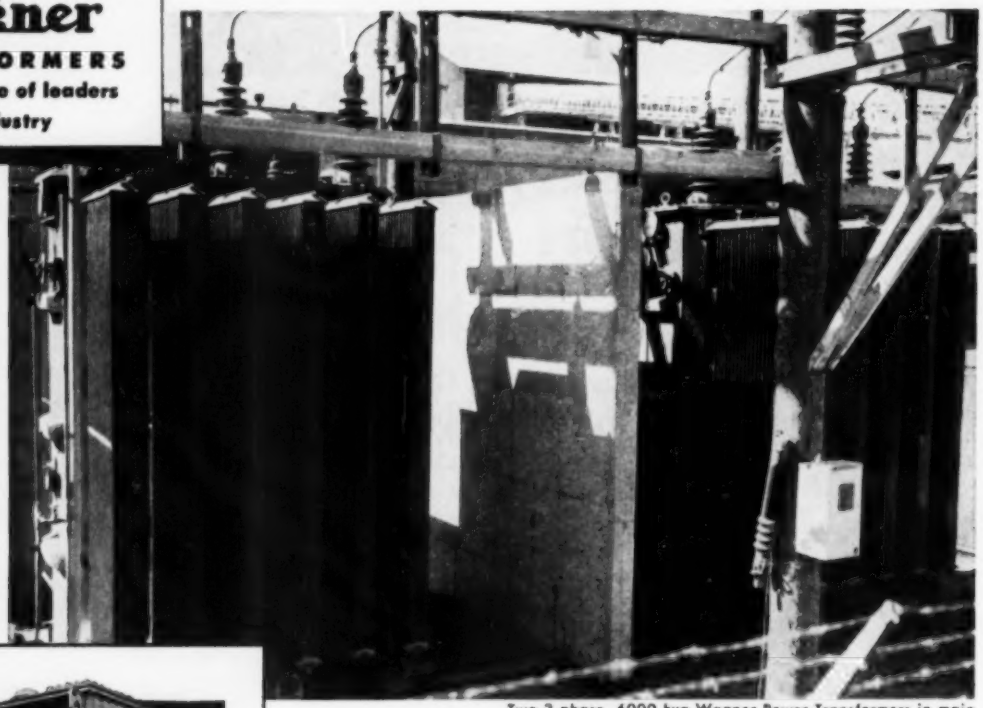
Klipfel WORRY-PROOFS YOUR LIQUID LEVEL CONTROL PROBLEMS

In many cases, you can save money by installing a good mechanical Klipfel Float Valve instead of an intricate, instrumentated controller. Your Klipfel Engineer or distributor can recommend Float Valves that literally "worry-proof" your liquid level control problems. To meet all requirements—pressure, temperature, type of fluid and closure—Klipfel Float and Lever Valves are made in 17 standard styles with a good range of sizes in each style. You can get a Klipfel Float and Lever Valve as small as ⅜" and as large as 12". Either direct acting or pilot control, and single or double seated types offer additional flexibility to meet any set of conditions.

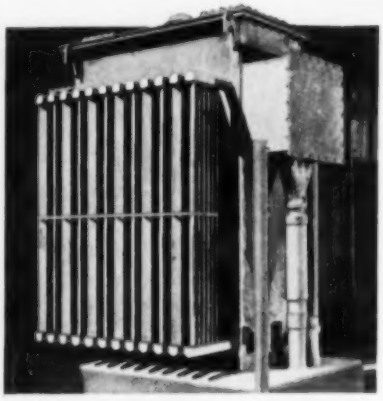
Many thousands of installations—large and small—in water and chemical services—have proved the quality of Klipfel design and workmanship over the past 40 years. Write for BULLETIN #349 which contains really useable information on the selection of float and lever valves.

Klipfel VALVES INCORPORATED
HAMILTON, OHIO

Wagner
TRANSFORMERS
...the choice of leaders in industry



Two 3-phase, 6000 kva Wagner Power Transformers in main substation — Missouri Portland Cement Company, St. Louis.



ONE OF FIVE Wagner 3-phase, non-inflammable liquid filled unit substation transformers used in this installation. Each transformer is rated 750 kva, 2400 to 480 volts, 60 cycle.

Wagner Power Transformers meet ASA C57 standards

Now, you can simplify your specifications and gain the advantages of improved design at reduced cost by ordering *standardized* Wagner Power Transformers. Wagner Transformers meet all ASA C57 standards for voltage ratings, taps, impedances and both standard and optional mechanical features. Get full information from your nearby Wagner engineer, or write us.

Wagner Transformers selected for modernized distribution system in midwest cement plant

The modernized Prospect Hill plant of the Missouri Portland Cement Company provides a fine example of an up to date distribution system in an application where considerable amounts of power are utilized at primary voltages. 12,000 kva of transformer capacity was required for connected and demand loads, with provisions for a 33 percent increase in capacity for future expansion.

Two Wagner 3-phase power transformers, each rated 6000 kva, with an ultimate of 8000 kva to be obtained with the addition of cooling fans, were used to meet this requirement for the main substation.

The distribution system uses five 750 kva unit substations, each located as close as possible to the load centers they serve. These substations are powered by 3-phase Wagner unit substation transformers, each with identical specifications.

Wagner transformers were chosen for this installation, as they are for a great many industrial and power company installations, because of their ability to give continuous service over unusually long periods of time. Consult a Wagner engineer on your next transformer installation, or write for Bulletins TU-180 and TU-181 for full information.

WAGNER ELECTRIC CORPORATION
6383 Plymouth Ave., St. Louis 14, Mo., U.S.A.

®Wagner Electric Corporation EST. WE 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

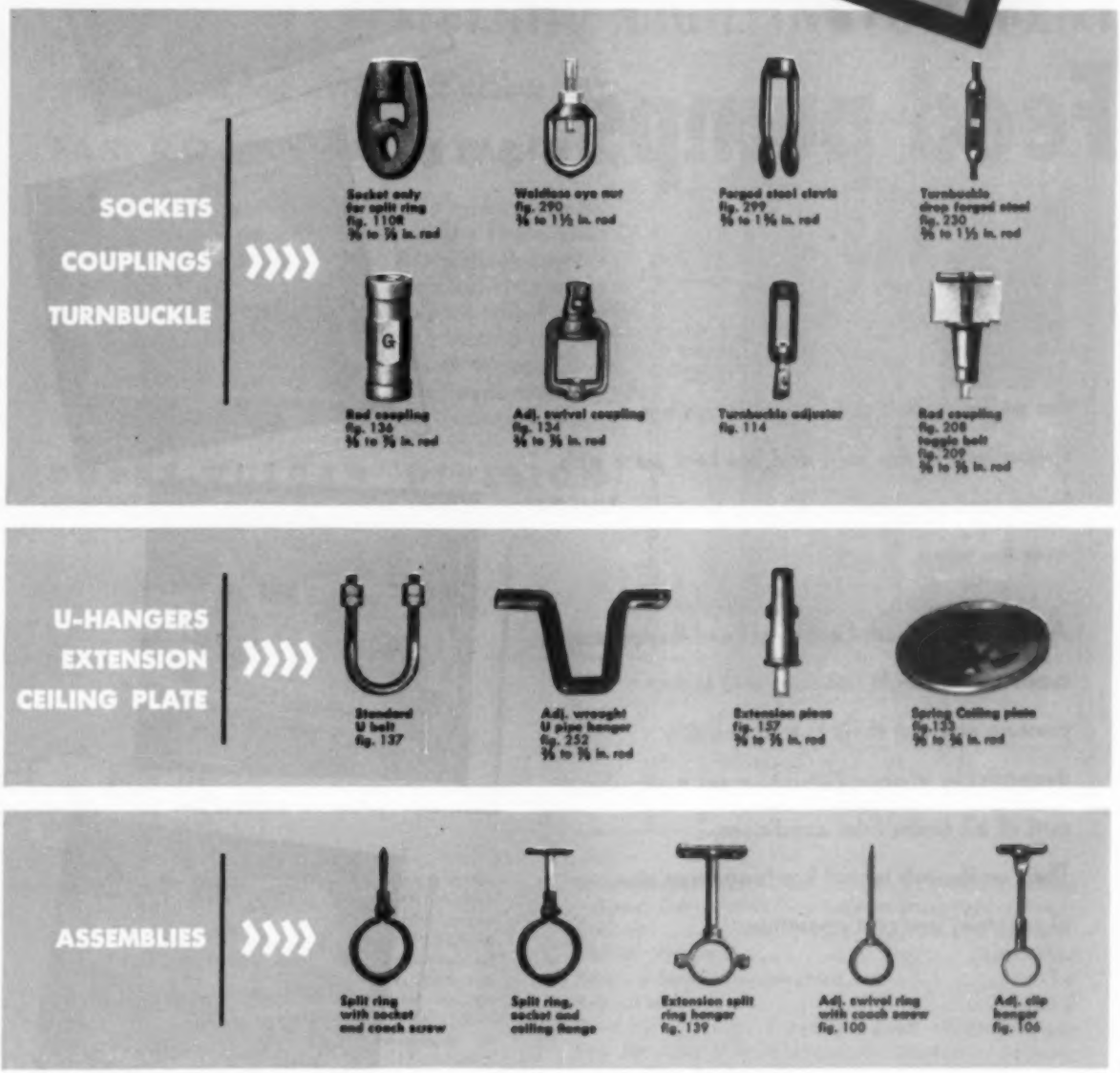
BRANCHES IN 32 PRINCIPAL CITIES

T53-6

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

NO. 5 OF A SERIES SHOWING THE GRINNELL LINE


SOCKETS
COUPLINGS
TURNBUCKLE
Socket only for split ring fig. 1108 ⅜ to ⅞ in. rod
Weldless eye nut fig. 290 ⅜ to 1½ in. rod
Forged steel clevis fig. 299 ⅜ to 1⅜ in. rod
Turnbuckle drop forged steel fig. 230 ⅜ to 1½ in. rod
Rod coupling fig. 136 ⅜ to ⅞ in. rod
Adj. swivel coupling fig. 134 ⅜ to ⅞ in. rod
Turnbuckle adjuster fig. 114
Rod coupling fig. 208 toggle bolt fig. 209 ⅜ to ⅞ in. rod
U-HANGERS
EXTENSION
CEILING PLATE
Standard U bolt fig. 137
Adj. wrought U pipe hanger fig. 252 ⅜ to ⅞ in. rod
Extension piece fig. 157 ⅜ to ⅞ in. rod
Spring Ceiling plate fig. 133 ⅜ to ⅝ in. rod
ASSEMBLIES
Split ring with socket and coach screw
Split ring, socket and ceiling flange
Extension split ring hanger fig. 139
Adj. swivel ring with coach screw fig. 100
Adj. clip hanger fig. 106

Call your local Grinnell Distributor, or write for Hanger Catalog.

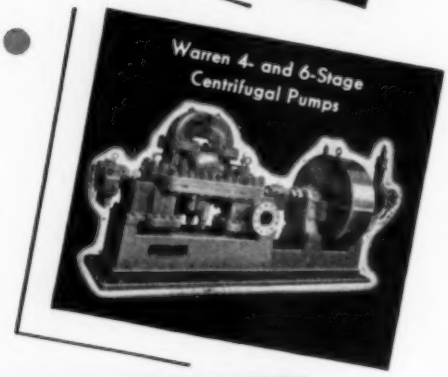
GRINNELL

AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

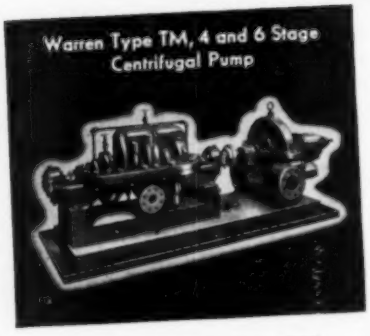
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

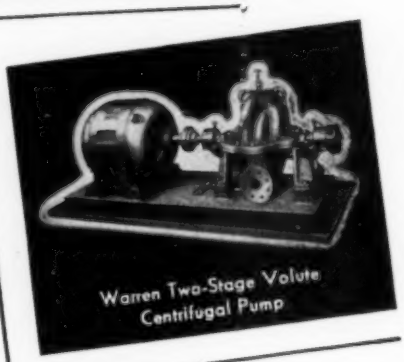
a boiler plant is no more dependable than its Feed pumps....



For well over half a century Warren has specialized in this field and has kept pace with boiler feed requirements as they have developed over the years.

As builders of both Centrifugal and Reciprocating types and for light, medium and higher pressure services, there is a thoroughly dependable Warren Pump to meet a very large part of all boiler feed conditions.
Their on-the-job record has long been one of reliable, low cost operation.





P-28

Time-Tested Experience Indicates it is Good Business

to Specify **WARREN PUMPS**

WARREN
QUIMBY PUMPS

WARREN STEAM PUMP COMPANY, INC., WARREN, MASSACHUSETTS

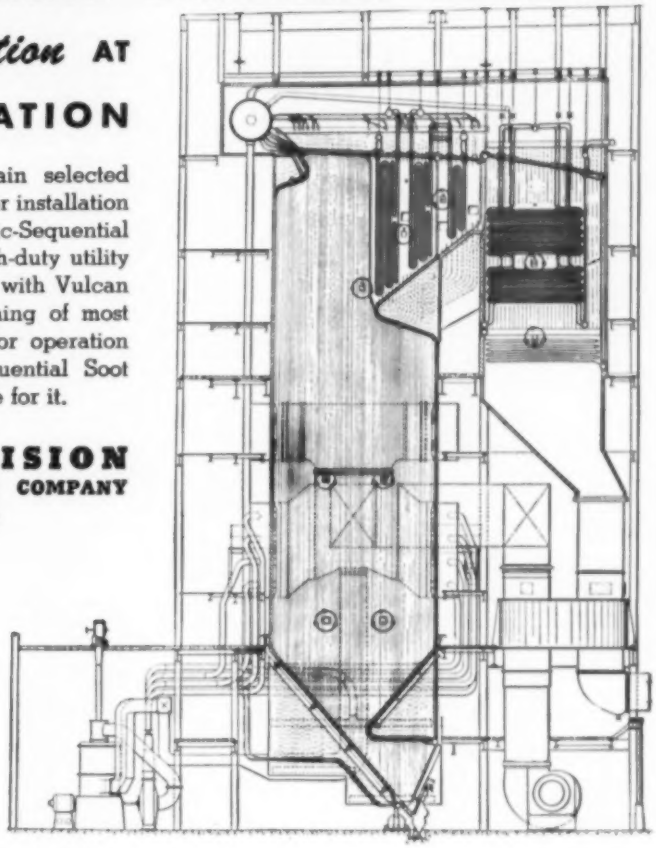
Centrifugal . . . . . Reciprocating . . . . . Rotary

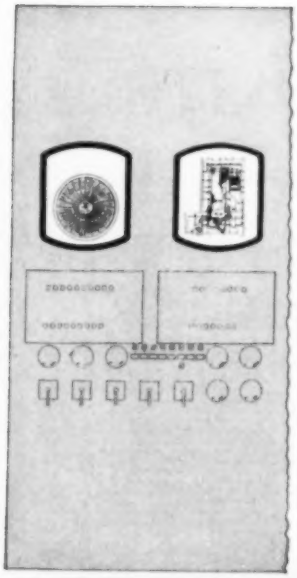
5th VULCAN System for LONG ISLAND LIGHTING COMPANY

An Outdoor Installation AT FAR ROCKAWAY STATION

Long Island Lighting Company has again selected Vulcan Automatics—this time for an outdoor installation at Far Rockaway—the fifth Vulcan Automatic-Sequential System for this utility. More and more high-duty utility and industrial boilers are being equipped with Vulcan Automatics. The reason is effective cleaning of most difficult locations, with minimized costs for operation and maintenance. Vulcan Automatic-Sequential Soot Blowing is described in Bulletin 483. Write for it.

COPES-VULCAN DIVISION
CONTINENTAL FOUNDRY & MACHINE COMPANY
ERIE, PENNSYLVANIA





Standing at this panel, the operator can start the blowing cycle, observe proper operation of each blower, see the system shut off automatically when the cycle is complete. He can also cut one or more blowers out of sequence, or repeat blower operation at any location.

Steam Generator.....Radiant-Reheat Type; Combustion Engineering-Superheater, Inc.
Capacity.....750,000 lb per hr
Throttle Pressure.....1450 psig
Primary Steam Temperature.....1005 F
Reheat to.....1005 F
Fired by.....Pulverized coal, oil, natural gas
Soot Blowing. Vulcan Automatic Sequential System, including necessary wall blowers, long retractables and controls for air-heater cleaners. All driven by, and blow with, air.
Consulting Engineers.....Ebasco Services, Inc.

VULCAN *Automatic Soot* **BLOWERS**

TYPICAL ANACONDA JOINTING KIT contains: lead sleeve, connector, solder, flux, paper pasters, insulating and shielding tape, filling compound, flushing compound, cotton yarn and tape, waste ends—and complete instructions. The kits are easy to order by catalog number.

ANACONDA JOINTING KITS

Here's how to make sure your stockroom doesn't overlook a *single vital item* . . . and your cable-installation crews have everything they need for a specific joint.

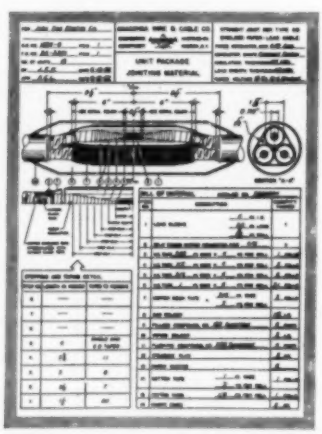
A single forgotten item lies on the stockroom shelf miles away. Your jointer has to stop work!

Someone grabs the wrong material in a hurry. The result is the same—wasted time and labor costs.

The remedy lies in the ANACONDA Unit Package of Jointing Material shown in the illustration above. Here in one conveniently-packaged kit is everything for one complete joint on a specific type and size of cable—impregnated-paper, varnished-cambric, rubber or thermoplastic. The kit is tailored to fit the cable perfectly.

Nothing has been left out. It's complete to a bill of materials and easy-to-follow instructions that assure a neater and better job. Every item has been laboratory- and service-proven—designed by power-cable specialists.

To keep pace with the increasing demand for ANACONDA Accessories, it has been necessary again to greatly increase the facilities of the Cable Accessories Department. This Department is now in a position to promise prompt shipment on most of your orders. Your Anaconda Representative can help you select suitable accessories from our complete line of potheads, insulating compounds, jointing kits, paints, connectors, etc. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 52403



BILL OF MATERIAL and sketch with dimensions are included . . . a handy check-guide for proper jointing technique!

Accessories for all types and sizes of bare and insulated conductors.

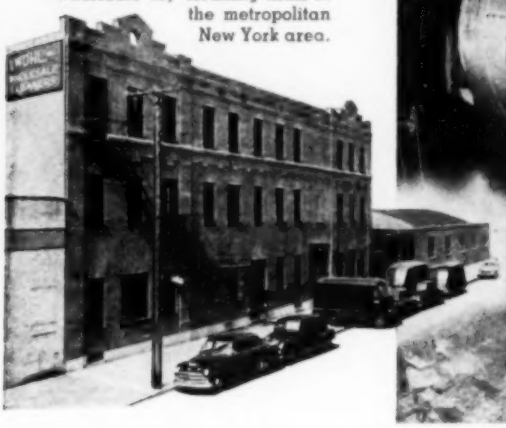
ANACONDA®

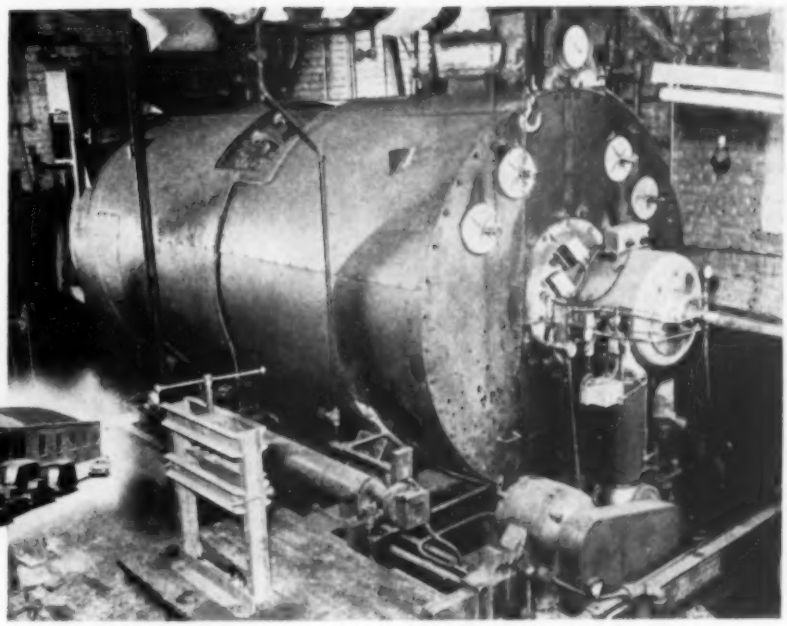
Powermaster®

CUTS STEAM COSTS ⅓

at large New York cleaning plant

I. WOHL, INC., Long Island City, N. Y., is one of the largest wholesale dry cleaning firms in the metropolitan New York area.





The 300 h.p. Orr & Sembower POWERMASTER boiler generates dry steam at 100 psi for drying, pressing, spotting, heating wash water, and for winter comfort heating. No. 6 Bunker C residual fuel oil is burned automatically.

● Here's what Henry Falkenberry, Chief Engineer at Wohl, has to say:

"The operating personnel are enthusiastic about the Orr & Sembower boiler. It is well liked by everyone principally because of its fully automatic operation and minimum attention that is required. The automatic operating controls keep the steam pressure constant even with widely varying steam demands.

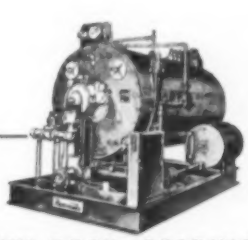
"Freedom from maintenance is another outstanding advantage to us. Cleaning is done once every six months and we feel this could be cut to once a year. The old boiler had to be thoroughly cleaned every week. Furthermore, there has been no work interruption or trouble of any kind encountered over the past two full years of 24-hour-a-day operation."

Before deciding on a boiler for your plant, be sure to get the facts on the newest POWERMASTER with VORIFLOW combustion. Write for this catalog that gives you the entire story of the *Powermaster* packaged automatic boiler. Just drop us a line and we'll put one in the mail for you.

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 h.p.; pressures to 250 psi.



ORR & SEMBOWER, INC. • *Established 1885* • 910 MORGANTOWN ROAD, READING, PA.

Growing like Jack's Beanstalk!

FOR YEARS, the Southern Railway System and many other organizations and individuals in the Southland have been saying to all America—"Come South, to find spectacular new opportunities in industry, agriculture and commerce." And our voices have been heard!

In the past decade, the South's rate of economic growth has far exceeded the national average in practically every category. In new construction, now at an all-time high. In expanded manufacturing output. In farm income, which has quadrupled. In per capita income and consumer sales.

Look back—and see how far we have come. Look ahead—and see the certainty of still greater progress and growth. Because all of us in the modern Southland are determined that it will *continue* to grow. And all of us will benefit.

Harry A. DeButts
President

THE SOUTHERN SR SERVES THE SOUTH

SOUTHERN RAILWAY SYSTEM

WASHINGTON, D. C.

LADISH

Controlled Quality

PIPE FITTINGS

offer dependability safeguarded by advanced metallurgy

Year after year . . . in all kinds of service . . . Ladish Controlled Quality Fittings set new standards of reliability. One reason is the strong reliance on technical progress. Every new facility and advanced technique of modern metallurgy is fully utilized to develop desirable physical properties to maximum limits . . . while unrelenting test procedures continuously safeguard metallurgical soundness and provide users with authentic data proving the complete dependability of every Ladish Fitting.

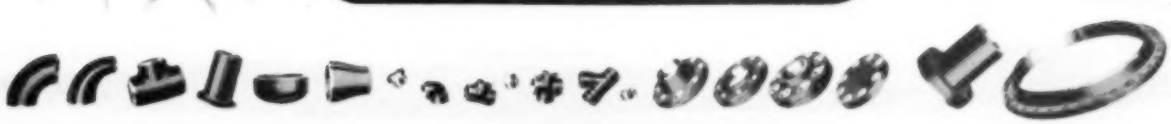
TO MARK PROGRESS

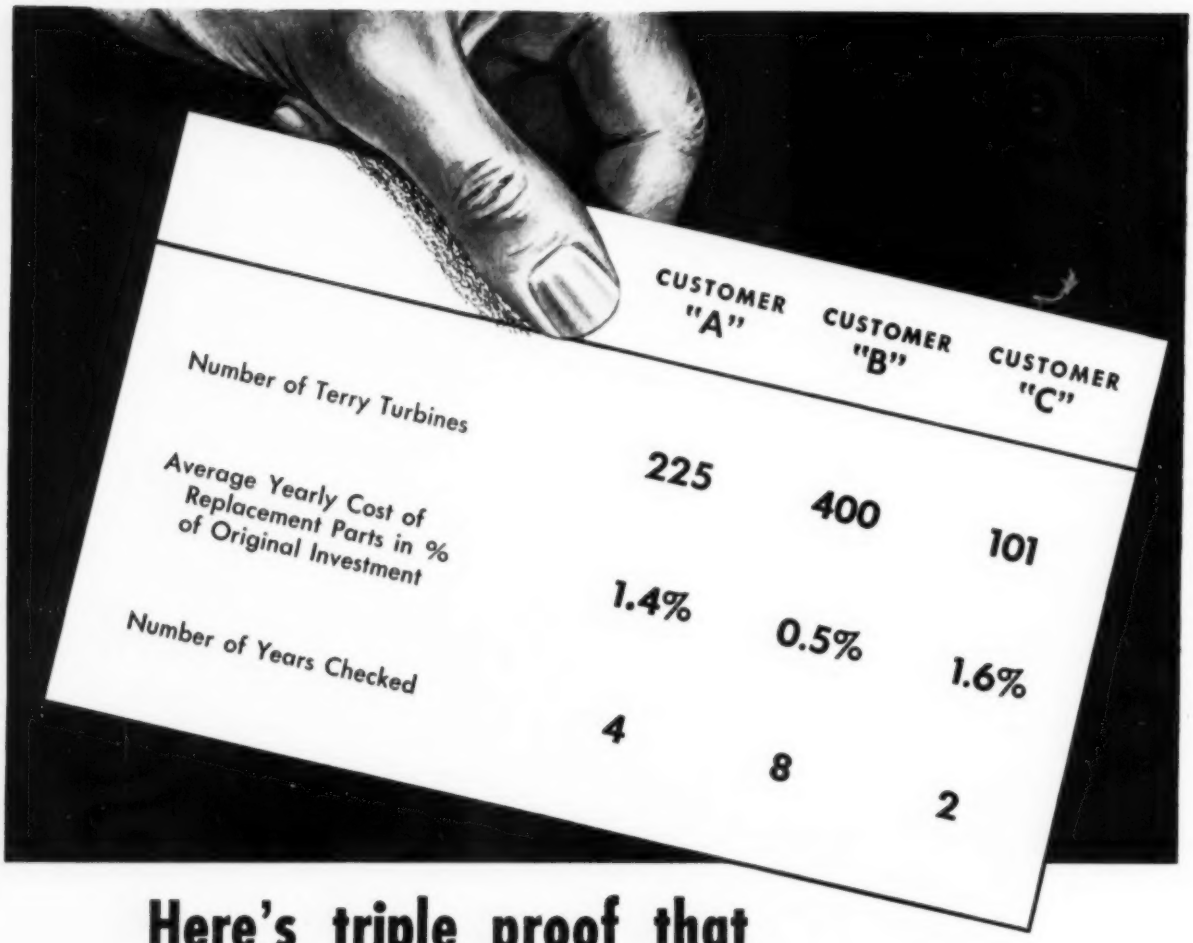
THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF . . . ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Bradford, Ont.





Here's triple proof that
IT PAYS TO SPECIFY TERRY TURBINES

When you combine the figures for these three customers — a total of 726 turbines — the average yearly cost of replacement parts works out to only 1.1% of the original investment. A truly remarkable record, even when you realize that they are Terry turbines.

But, the cost of replacement parts is only the beginning of the story. The real savings are in the labor costs and production losses which are reduced so drastically when you install Terry turbines.

Send for further information about these low-maintenance turbines. Bulletin S-116 describes the many advantages of the Terry solid-wheel turbine. For multistage turbines, ask for a copy of Bulletin S-146.

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1196

ACCURACY

of Regulation.....

Just as the champion bowler maintains *top* control when he chalks up a "strike", the Leslie team wraps up perfect performance in LESLIE Temperature Regulators.

There's a LESLIE Regulator for every temperature control problem—designed to meet the demand for accurate, reliable, constant temperature regulation.

It will pay to explore the advantages of—

TRADE LESLIE MARK

- **Single Seated Construction**
- **Calibrated Dial Adjustment**
- **Duomatic Control**
- **Liquid Filled Elements**
- **Other Leslie Features**

All described in Bulletin 464, available on request.

LESLIE CO., 261 Grant Avenue, Lyndhurst, New Jersey

QUALITY REGULATORS FOR OVER HALF A CENTURY

It's the HUMAN ELEMENT

that makes the DIFFERENCE in SOUTHERN NATURAL SERVICE

Key factor in Southern Natural Gas Company's round-the-clock service is the *human element*.

Not that modern machinery and techniques aren't important too. For the very best in equipment keeps natural gas surging through Southern Natural's 2835 miles of big steel pipe.

But most of all we are proud of Southern Natural's people. Their specialized skills and their willingness to put out that *extra effort* have helped make *their* company one of the leaders in the pipe line industry.

MISSISSIPPI GEORGIA ALABAMA LOUISIANA • TEXAS

Southern Natural Gas Company

Watts Building, Birmingham, Alabama

What is your special packing problem?

- ☐ Pressure
- ☑ Maintenance
- ☐ Acids
- ☐ Alkalis
- ☐ Complicated inventory
- ☐ Temperature
- ☐ Petroleum products
- ☐ Food products

If it's maintenance . . .

use R/M Vee-Flex® — the packing that provides better sealing with fewer gland adjustments

The unique design of the R/M Vee-Flex Packing Ring provides automatic sealing without constant gland adjustment. The hydraulic principles of this design have been demonstrated by photoelastic stress analyses* and radial pressure tests.*

R/M Vee-Flex Rings are available for all sizes of rods and rams, and for pressures of 6000 psi and higher. Special types are available for use with foods and petroleum products.

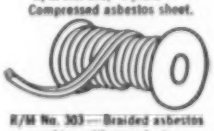
Whatever your packing problem, the authorized R/M distributor near you has a packing engineered to your needs and your budget. Call him today or write us for the R/M Packing Catalog.

R/M is ready to meet your requirements for Teflon Packings, Gaskets, Rods, Sheets, Tubes and Tape.

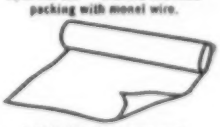
*Performed at the Franklin Institute Laboratories for Research and Development.

**Du Pont trade-mark for its tetrafluoroethylene resin.

R/M No. 650, "Pyroid"® — Compressed asbestos sheet.



R/M No. 303 — Braided asbestos packing with monel wire.



R/M K-68 — Neoprene and compressed asbestos sheet.

R/M versi-pak® — For general use.

R/M Teflon** Nos. 830, 836 — For acids, caustics or chemicals.

R/M PACKINGS

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn., Manheim, Pa. Passaic, N.J. No. Charleston, S.C. Crawfordsville, Ind., Canadian Raybestos Co. Ltd., Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Teflon Products • Asbestos Textiles • Industrial Rubber Products • Abrasive and Diamond Wheels Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Sintered Metal Products • Bowling Balls

"Experience showed us how **FUSETRON FUSES** Prevent Motor Burnouts . . . now we protect all Motors on our Units with them!"

Franklin Van Reed
Production Engineering Supervisor
ORR & SEMBOWER, INC., Reading, Penn.

"Here's what Happened in our Plant"

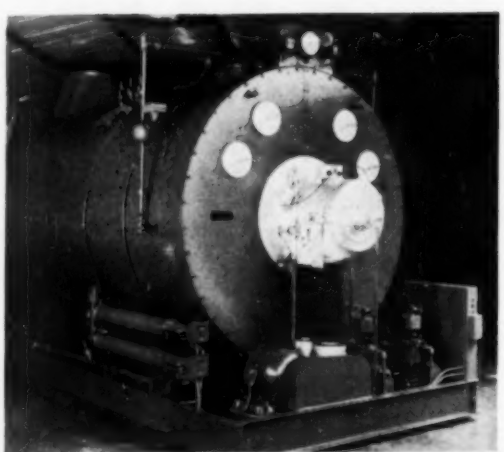
Back in January of 1951 we had a motor on a pump that was supposed to draw a maximum load of about 8 amperes, yet it began blowing FUSETRON fuses of motor protection size.

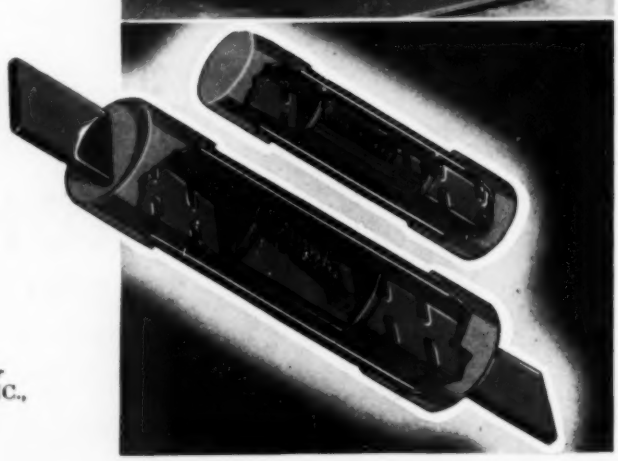
"We were inclined to believe something was wrong with the fuses — but after checking with an ammeter we found that an automatic relief by-pass was sticking and causing the motor to draw about 12 amperes.

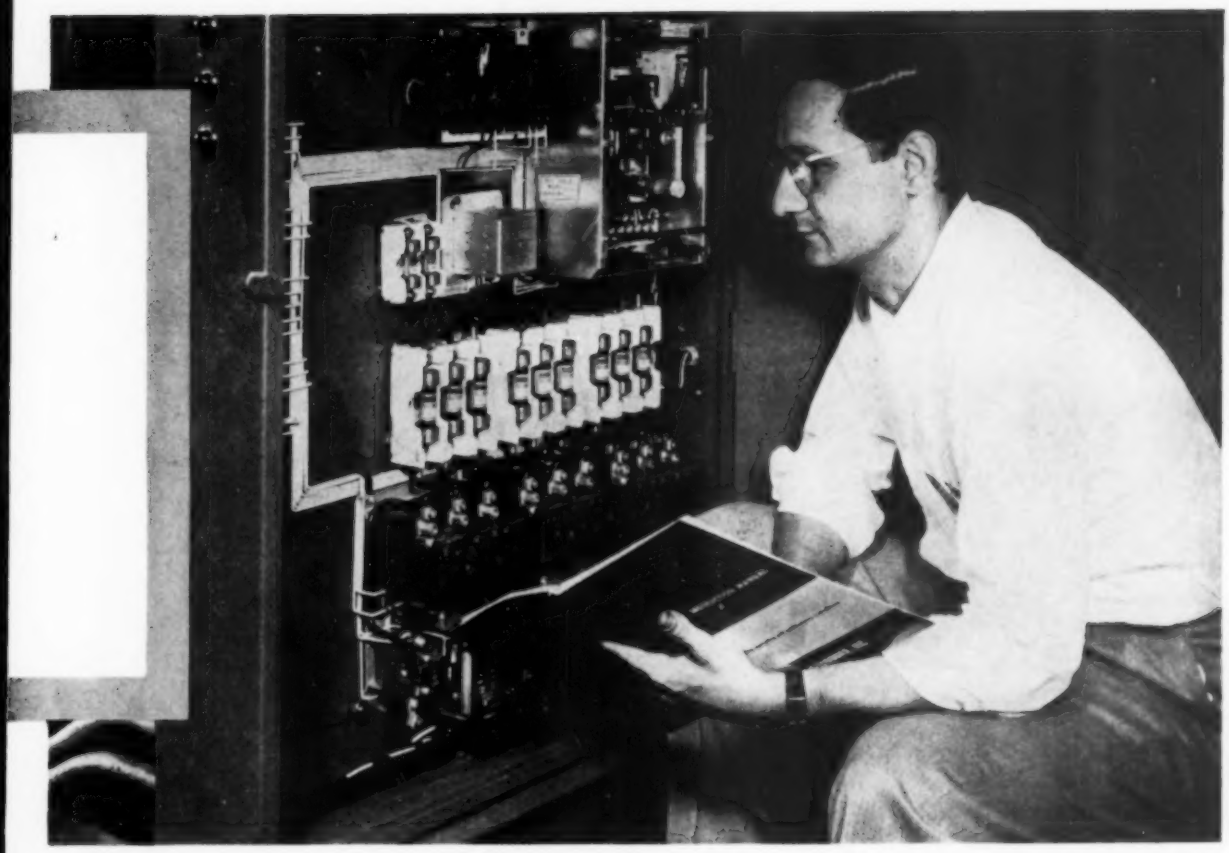
"If the Fusetron fuses had not opened, the motor would undoubtedly have burned out.

"Now on all our Powermaster Steam Generator Units we use Fusetron Fuses to protect the motors on the fuel pump, the boiler feedwater makeup pump, and the air compressor."

Franklin Van Reed
Production Engineering Supervisor
ORR & SEMBOWER, INC.,
Reading, Pennsylvania







You, too, can profit by the

10 POINT PROTECTION of Fusetron Dual-Element Fuses . . .

1 Protect against short-circuits.*
2 Protect against needless blows caused by harmless overloads.
3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5 Protect motors against burnout from overloading.
6 Protect motors against burnout due to single phasing.
7 Give DOUBLE burnout protection to large motors — without extra cost.
8 Make protection of small motors simple and inexpensive.
9 Protect against waste of space and money—permit use of proper size switches and panels.
10 Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

THE MONEY YOU SAVE . . . by preventing one **needless** shutdown, one **lost** motor, one **destroyed** switch or panel or one **burned out** solenoid . . . MAY MORE THAN PAY FOR the replacement of all your ordinary fuses with Fusetron dual-element Fuses.

THIS COUPON WILL BRING YOU complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. (Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

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Company _____

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"I sure did specify Hagan Automatic Combustion Controls,

and here's why . . . I specified Hagan Combustion Controls because they are accurate. We don't waste fuel with them. They are built to last, too, and they require practically no maintenance."

Dependability is important. So is accuracy. If as little as one per cent of the fuel your boiler uses during its life is wasted, the cost of this wasted fuel can be five, six or seven times the original cost of the control system!

That is why you are *not* saving money if you buy anything less than the best—dependable Hagan Combustion Controls.

Our engineers are at your service, and will be glad to discuss all types of combustion control applications with you. For full information, write, wire or phone Hagan Corporation.

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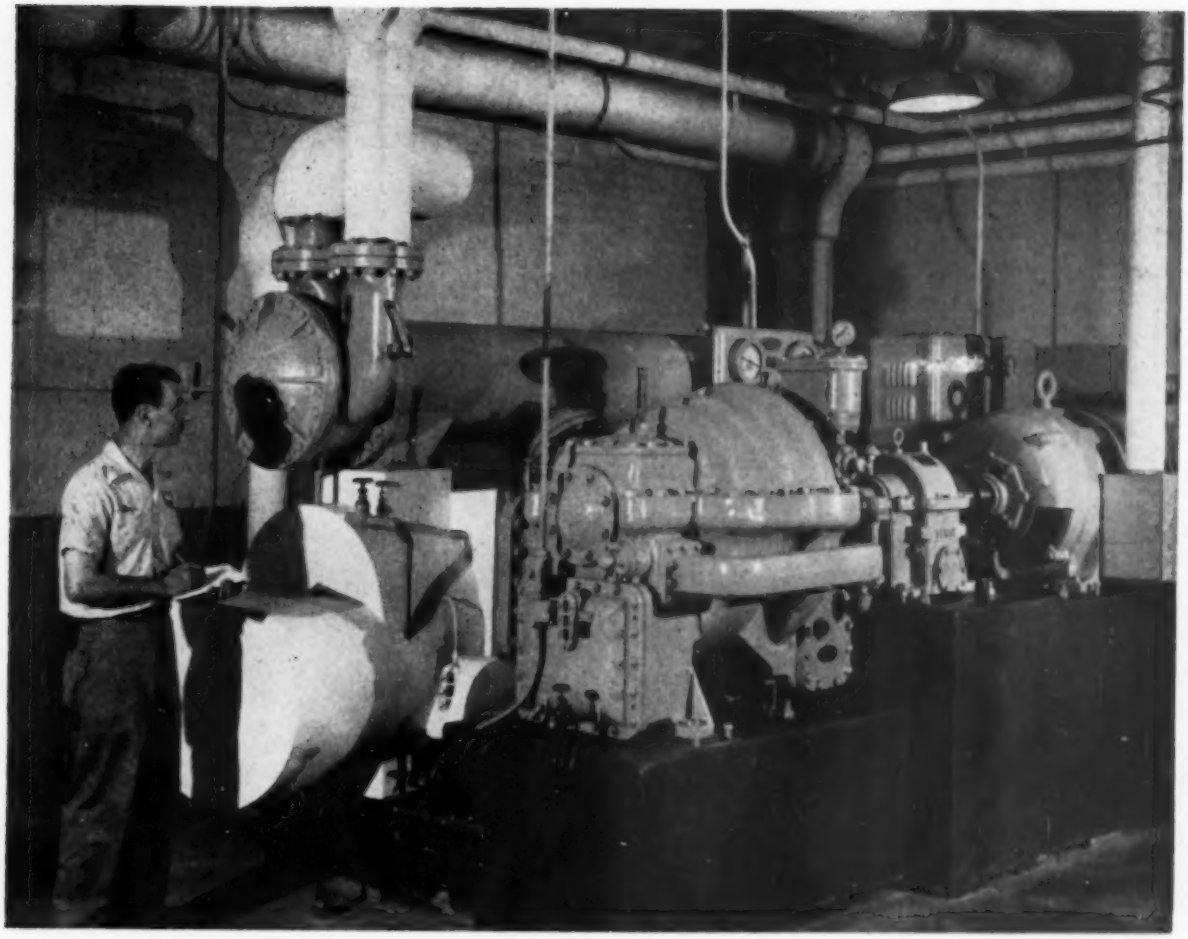


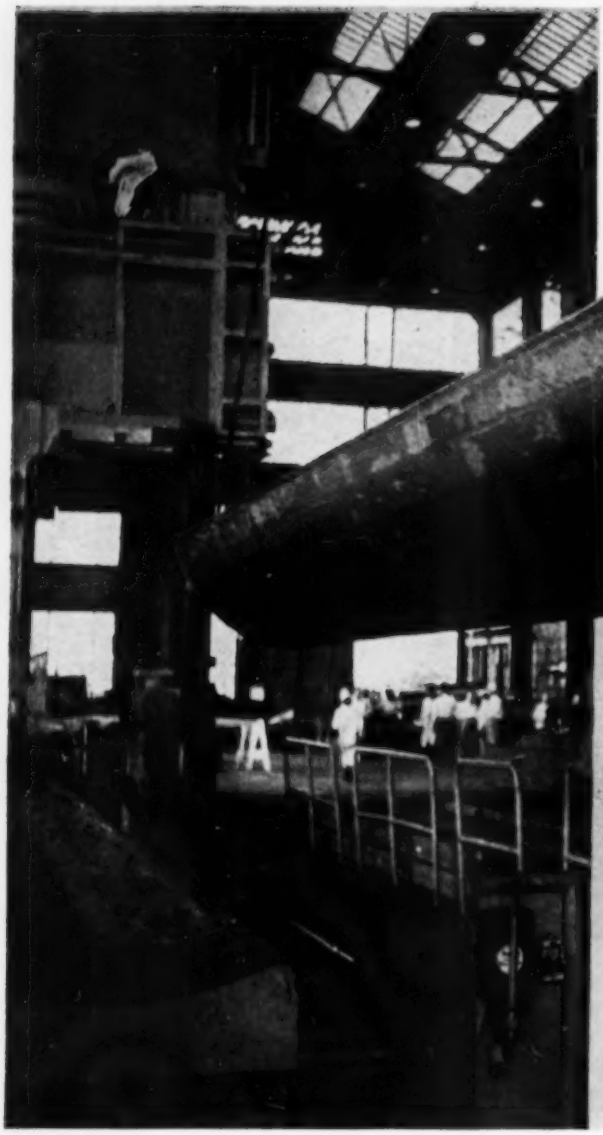
You Can't Tell

YOU CAN'T DETERMINE efficiency by sound alone. Just because the wheels of your machinery are humming does not necessarily mean that down time caused by faulty lubrication is being held to a minimum. The problem of lubrication becomes more important and more difficult with the ever increasing complexity of modern industrial equipment operating at higher speeds with closer and closer tolerances, higher loads, and under varying operating conditions. To be sure of having the proper lubricants to fill your specific needs, call an experienced Standard Oil lubricating engineer. His knowledge, gained through constant contact with the power industry, is backed by the world's largest combined facilities for the research, testing and engineering of petroleum products. It will be well worth your while to call him today.

Standard Oil Company
(KENTUCKY)

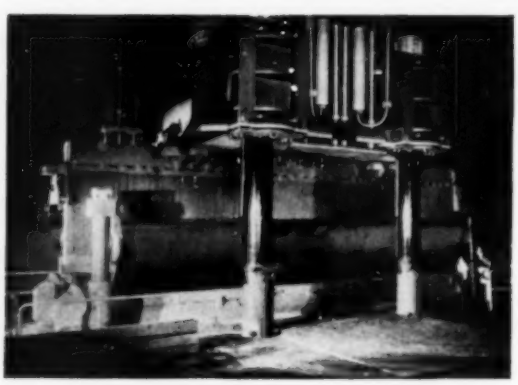
STANDARD OIL
LUBRICANTS

BIG "NEWS" at B&W



This mammoth draw bench installed by Babcock & Wilcox introduces into America a unique method for faster forming of headers and other seamless hollow forgings for the high pressure and temperature conditions in modern steam generating units. This method uses less steel, is quicker and more flexible than previous procedures . . . heavy-wall piping and hollow boiler parts up to 35 inches outside diameter with 4½-inch walls and 22 feet long are forged with great speed.

Huge steel plates 42 feet long are formed into sections of massive boiler drums on a new press installed by Babcock & Wilcox. Largest ever built for this purpose, the press is speeding fabrication of modern steam generating units by considerably reducing total plate bending time and permitting use of fewer and larger boiler drum sections, thus eliminating welding and X-raying of additional seams required when smaller plates are used. The new press bends thicker boiler drum plate than does any other equipment now in operation.



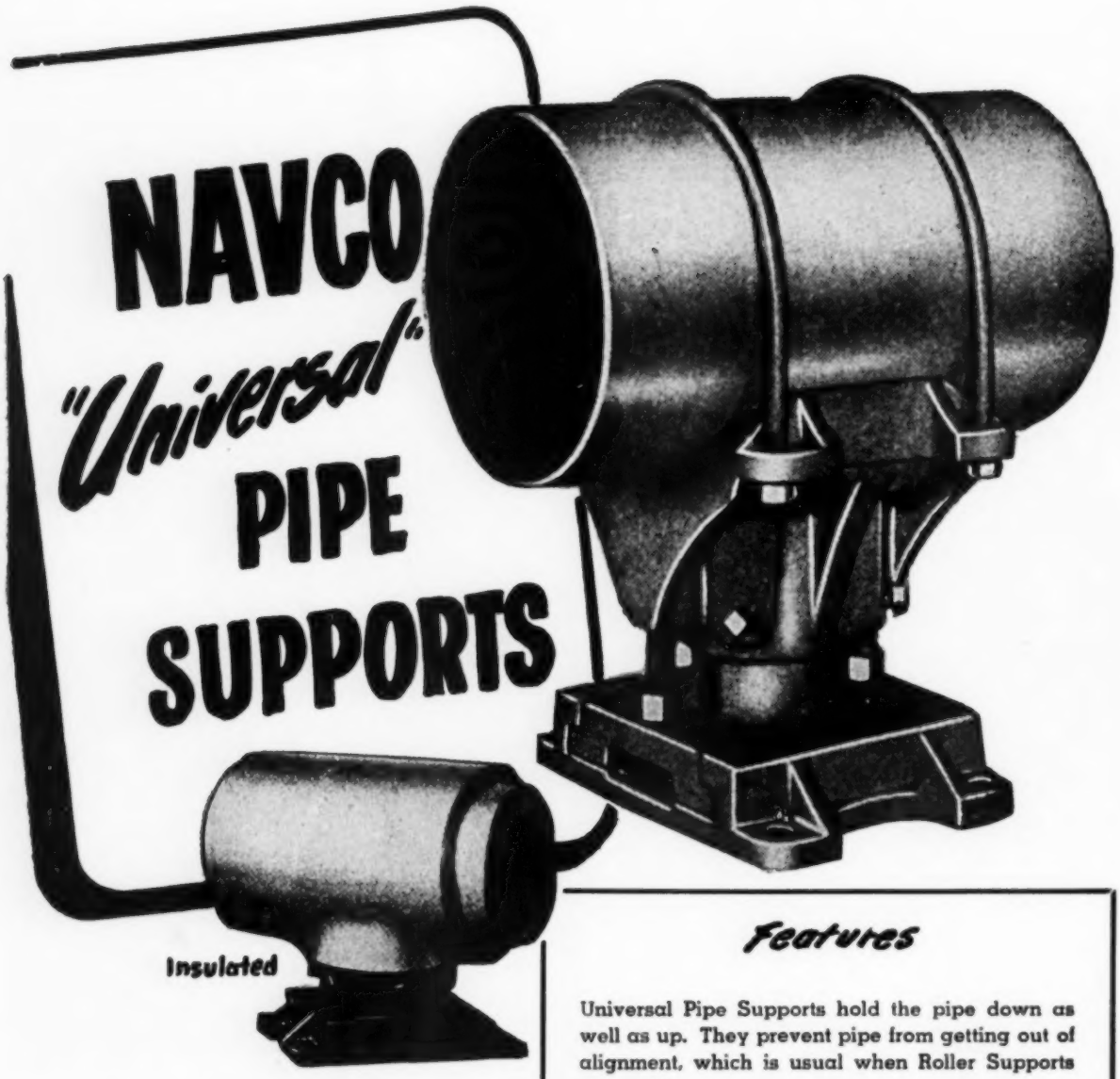
. . . speeding MORE POWER for America

Highlighting a multi-million dollar expansion program at Babcock & Wilcox are two new giant machines to speed production of steam generating equipment for central stations, industrial plants, institutions, public buildings and apartment houses, chemical plants, oil refineries, and merchant and naval vessels. Along with other new production facilities, more trained personnel, and three additional plants, these new machines are geared to forecasts of, and B&W's faith in, America's industrial future.

BABCOCK & WILCOX

G-580T

NAVCO "Universal" PIPE SUPPORTS



Vertical adjustment up to 2½ inches can be made.

Support may be turned to any angle of 360°.

Will take care of 8 inches of travel.

Features

Universal Pipe Supports hold the pipe down as well as up. They prevent pipe from getting out of alignment, which is usual when Roller Supports are used.

They permit control of expansion movement and insure the desired free action of Slip Expansion Joints so essential in tunnel and duct work.

Expansion movement of pipe will not disturb the insulation.

Made in Cast Iron or Steel and provided with forced lubrication for lines exposed to the weather.

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NAVCO PIPING

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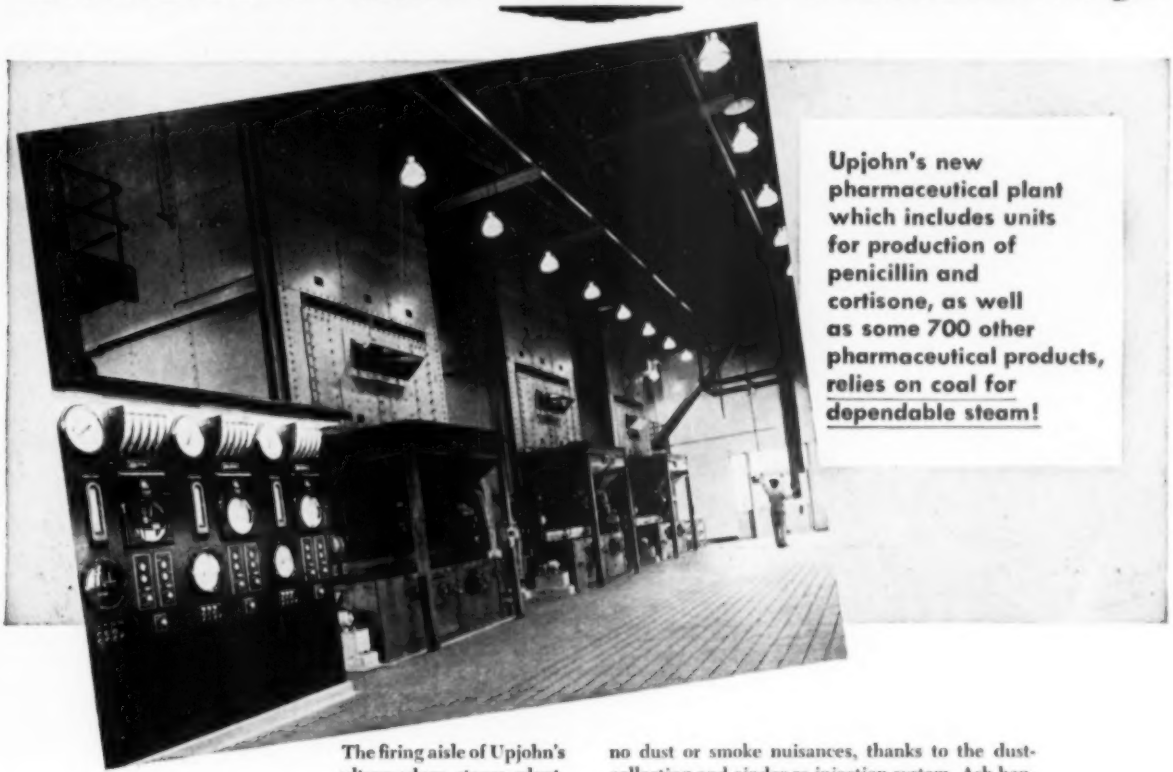
For LOW-COST DEPENDABLE steam,

UPJOHN burns COAL the modern way!



Upjohn's new pharmaceutical plant which includes units for production of penicillin and cortisone, as well as some 700 other pharmaceutical products, relies on coal for dependable steam!

The firing aisle of Upjohn's ultramodern steam plant. This plant supplies steam, cleanly and efficiently, at only 40¢ to 42¢ per 1,000 lbs. for the Portage Road Plant near Kalamazoo, Michigan. There are no dust or smoke nuisances, thanks to the dust-collecting and cinder re-injection system. Ash handling is fully automatic. These 3 boilers, plus a fourth recently installed (not illustrated), deliver up to 115,000 lbs. steam per hour at peak load.

Whether you're building a new plant or modernizing an older one, you can count on coal for dependability and low-cost operation.

Here's why: Up-to-date coal-burning equipment can give you 10% to 40% more steam per dollar. Automatic coal- and ash-handling systems can cut your labor cost to a minimum. Let a consulting engineer show you how a modern coal installation, tailored for your specific needs, can save you real money.

Here's something else, too—of all fuels, coal alone has virtually inexhaustible resources. This, plus the fact that America's highly mechanized coal industry is the most efficient in the world, assures you of a dependable supply of coal at relatively stable prices now and for years to come.

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

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As the world's largest manufacturer of tubular steel products, we've had a chance to analyze thousands of tubing installations. We've recorded our findings and the results are available to you.

If you are having trouble with high pressures, corrosion, heat or exposure, give us a chance to help you the next time you are ready to order tubing. Even if you consider your problem unique, remember that our case history file may contain a problem and solution similar to yours. A problem that is entirely new to you, may be one that we have encountered before.

This National Tube service is particularly useful today, when so many grades of alloy and stainless tubing are in short supply. We may be able to help you choose an alternate grade of steel that will do a good job for you at little or no increase in cost. For more information, write National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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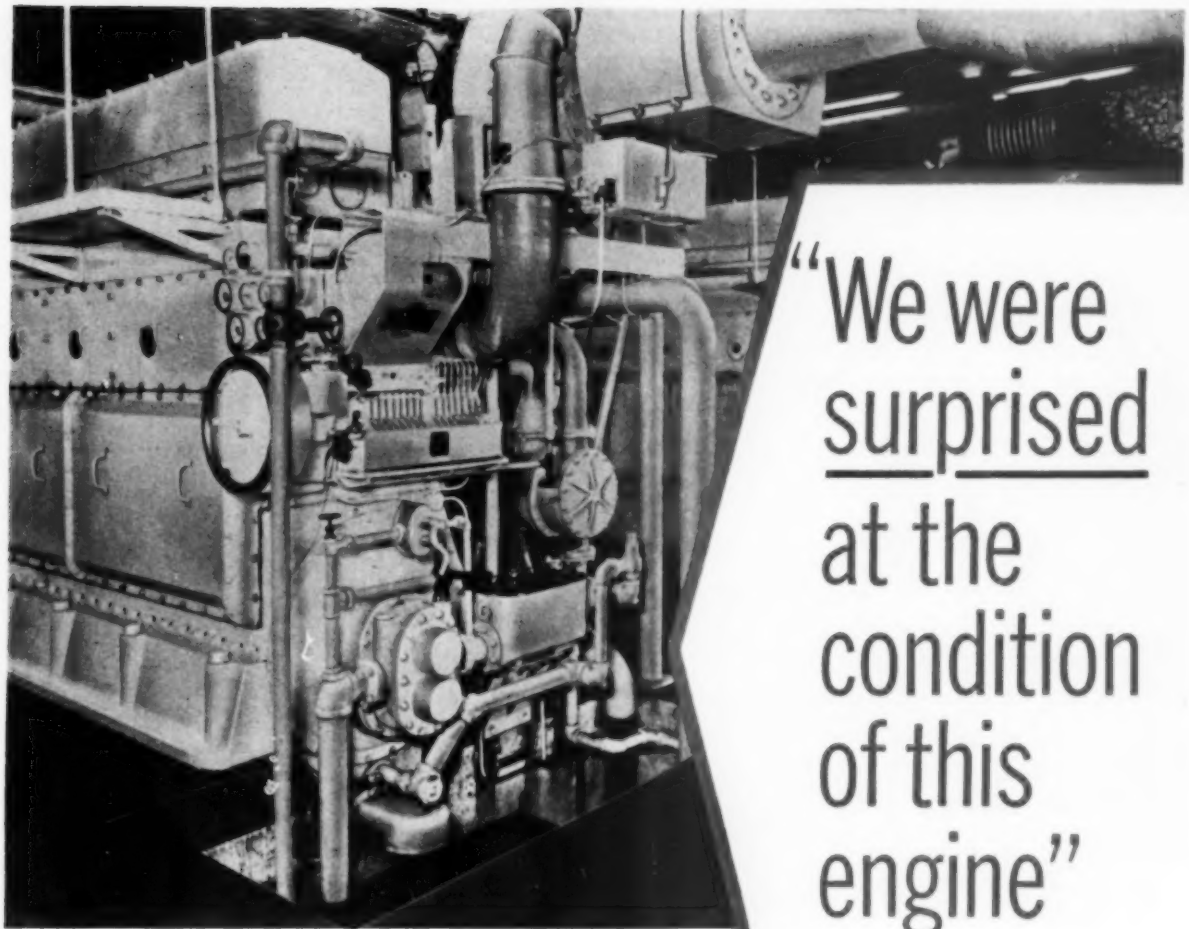
UNITED STATES STEEL



"We were surprised at the condition of this engine"

... says G. V. Yarger,
Supt. Municipal Utilities
Waverly, Iowa

"When we finally opened up our Worthington, it was in the *best* condition I've ever seen a diesel engine that had operated such long hours and under such heavy loads as this unit. It had a total of 48,926 hours on it – 8,987 hours of tough operation since the last overhaul.

Mr. Yarger continues, "We've been using Sinclair RUBILENE® Heavy in the crankcase and RUBILENE H.D. 30 in the cylinder lubricator. These RUBILENES have kept the crankcase and upper portions of the cylinders exceptionally clean and bright, with no sign of carbon or deposits."

That's a typical report on the exceptional qualities of the Sinclair RUBILENES . . . evidence that they could improve the efficiency of *your* diesels, too. Why not switch now? Contact your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

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save wear and replacements

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... IN POWER PIPING?

Above all other things, you must have CONFIDENCE in it.

Confidence can't be purchased—it is acquired only through complete belief in the pipe fabricator's skill, facilities, technical knowledge . . . and *experience.*

P. P. & E. has been fabricating all types of high-pressure, high-temperature piping for central stations, paper mills, process and industrial plants for almost half a century. The importance of this experience, to you, is its great value in avoiding errors of omission and commission which can result in inefficiency, damage to expensive equipment, and dangerous operating conditions.

When P. P. & E. does the job, utmost care is taken to evaluate and interpret specifications correctly, and to comply strictly with code and insurance company requirements. Highly specialized shop facilities for bending, welding, Van Stoning, machining, heat-treating, testing, and inspection have been developed, and are operated by skilled workmen under competent supervision. A trained field organization directs the installation of complete systems, extensions, or alterations to existing layouts in any part of the country.

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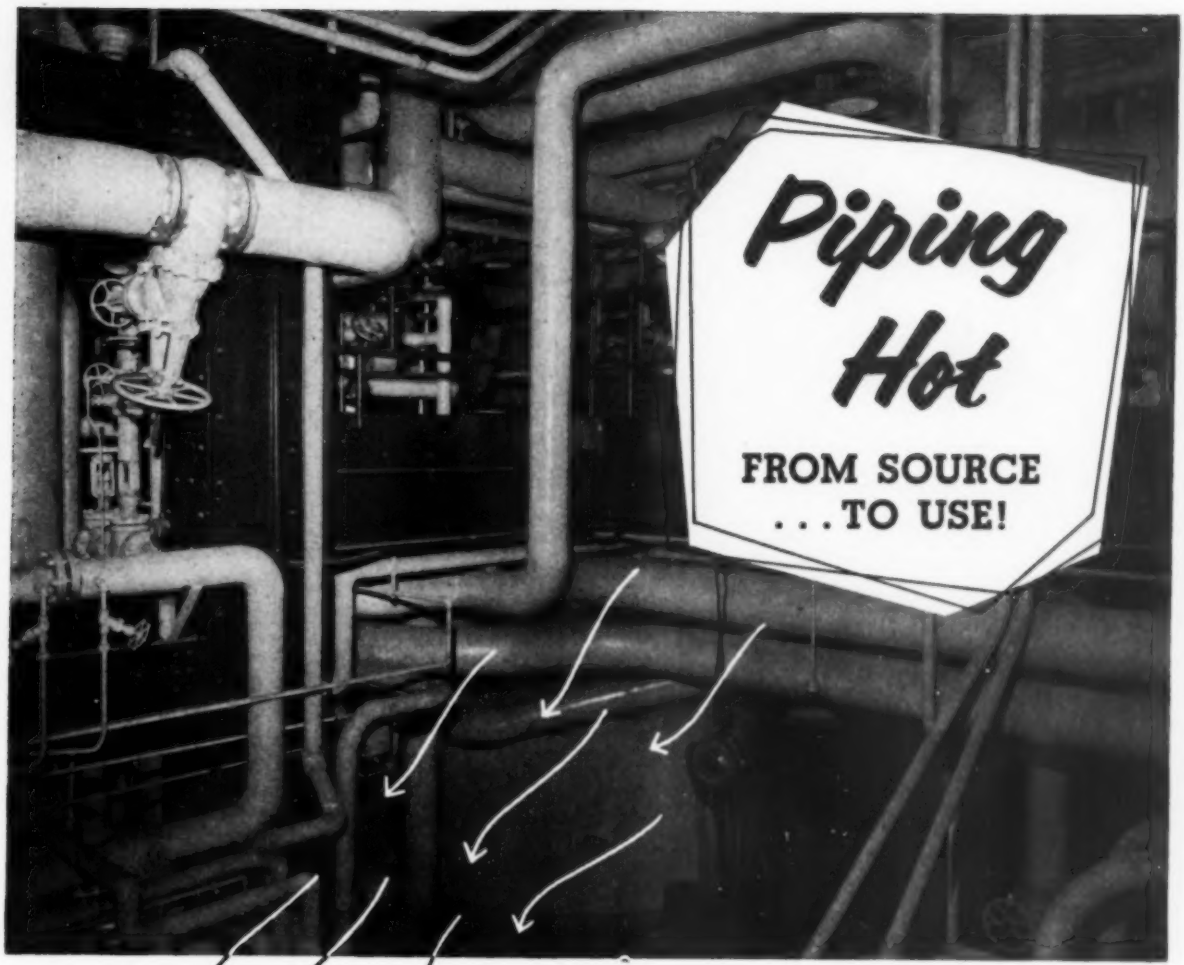

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for Temperatures up to 1200°F

High thermal efficiency! That's one of the features of Unibestos Pipe Insulation. It's an outstanding b.t.u. barrier.

Yes, and it's easy to fit—cuts quickly, cleanly. And Unibestos lasts and lasts because it's highly resistant to moisture, fumes, vibration, and impact.

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Powell Engineers always look to the future!

Powell Valves are not only made in every type, size and material needed to meet all your flow control requirements but, because Powell Engineers always look to the future, they give special attention to those important details in design that make all Powell Valves give such long, dependable service and require so little maintenance.

The Wm. Powell Company
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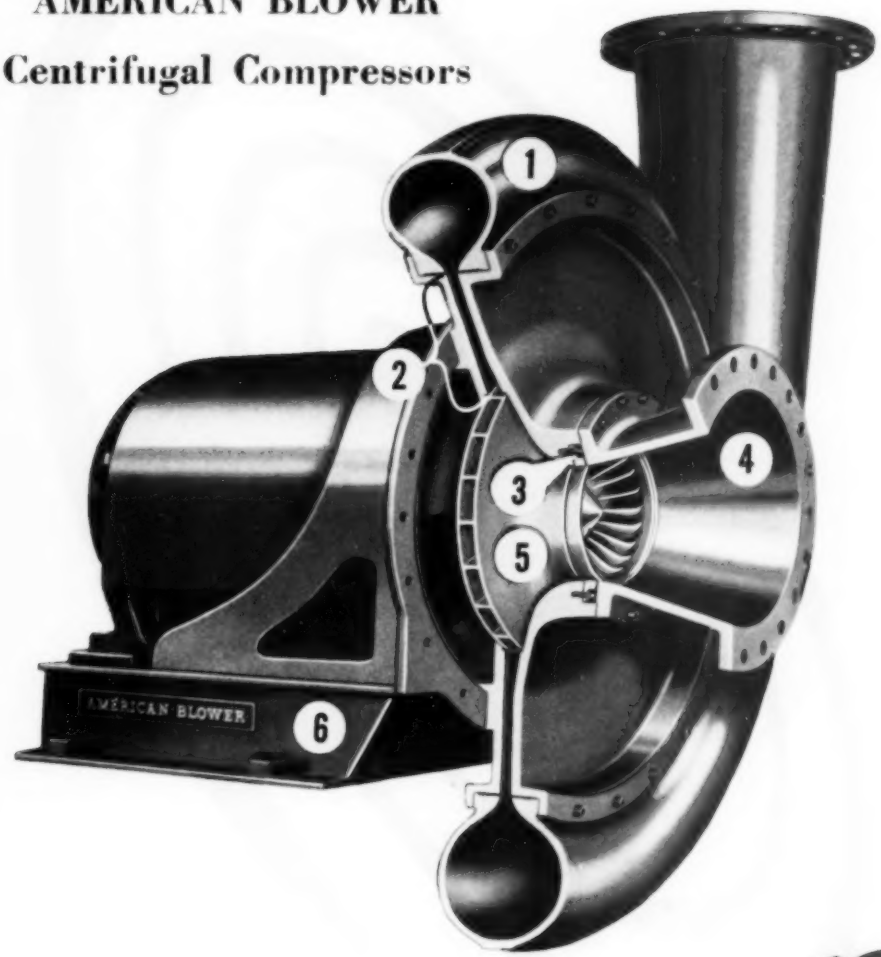
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES

AMERICAN BLOWER

Centrifugal Compressors



American Blower Centrifugal Compressors offer outstanding design features which improve efficiency, facilitate installation and minimize maintenance.

In the cutaway view, above: (1) Improved, scroll-shaped, casing design increases compressor efficiency. (2) Unobstructed diffuser passage efficiently converts velocity energy into pressure. (3) Annulus packing, having machined labyrinths, minimizes recirculation of gas around the impeller inlet. (4) Removable inlet nozzle. (5) Aerodynamic design of impeller blades results in high efficiencies. (6) Welded-steel baseplate "stress relieved" prior to machining, assuring maintained alignment.

For data, ask our nearest branch office.

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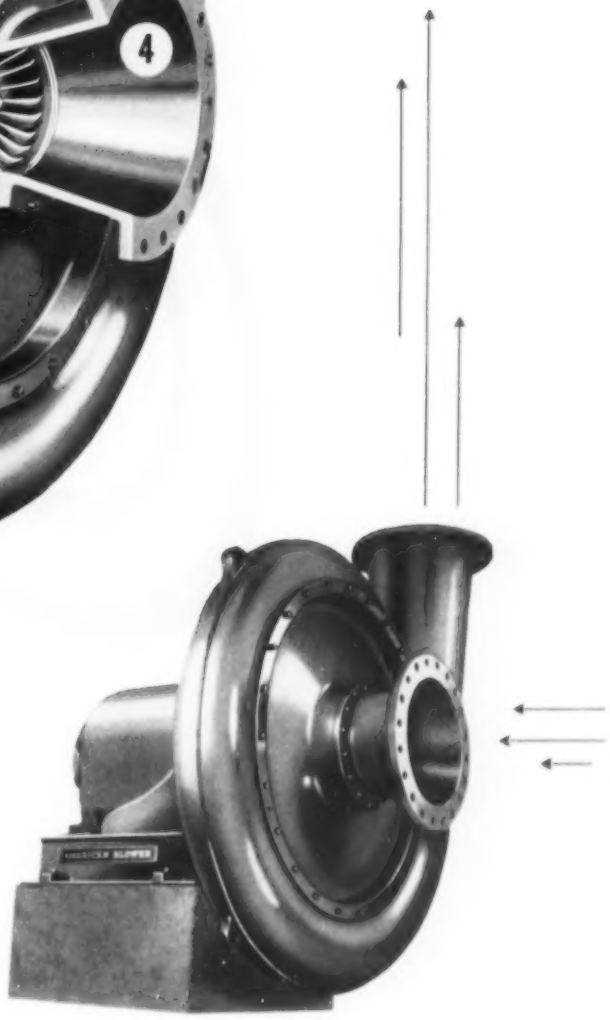
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation



American Blower Single Stage Centrifugal Compressors are available in sizes 30 to 600 h.p., and pressures $1\frac{1}{4}$ to $3\frac{3}{4}$ lbs.

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

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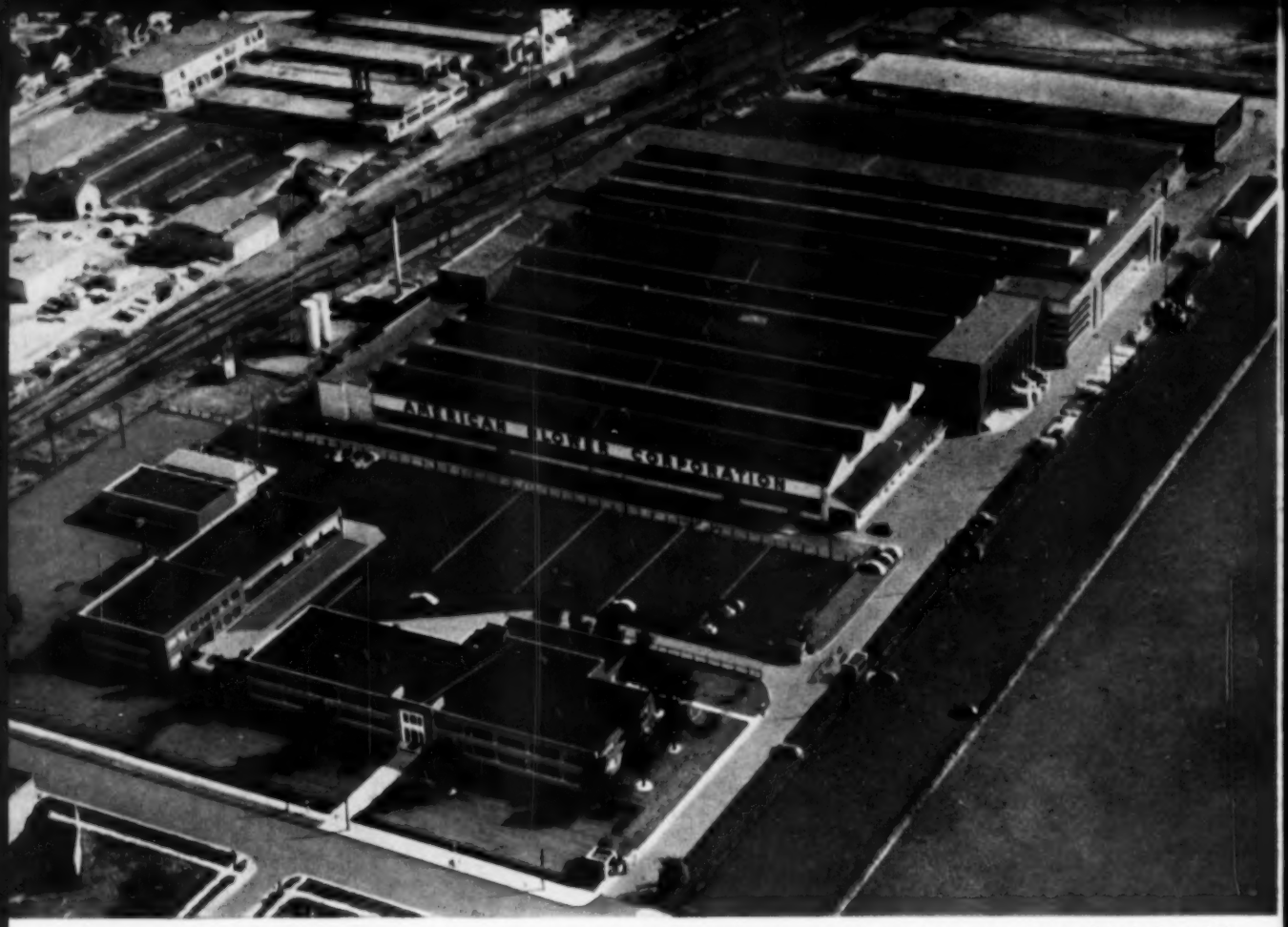
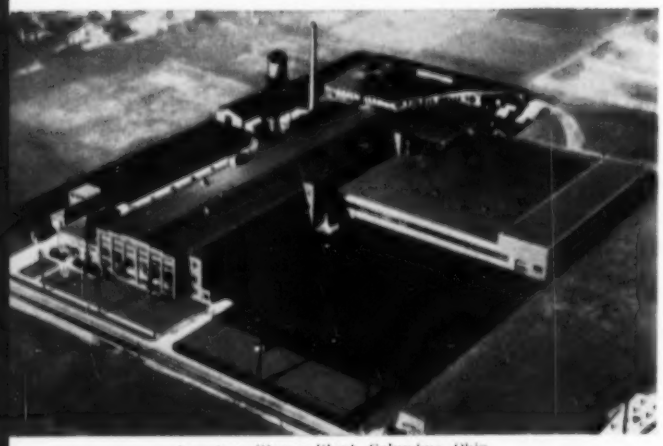


American Blower main plant and office, Dearborn, Mich. Here are located the finest research and sound laboratories and engineering facilities in the industry.



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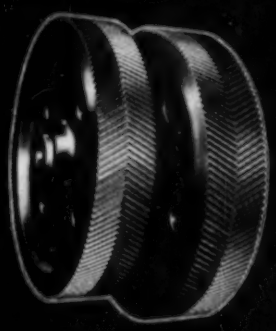

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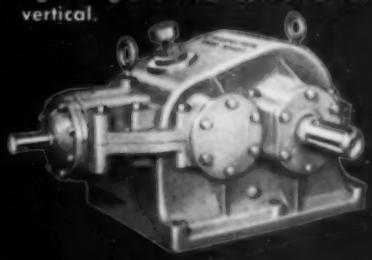
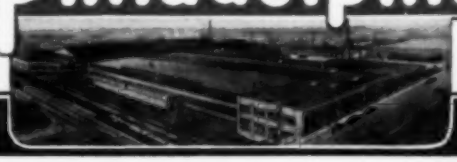


For catalogs or detailed information, write Virginia Gear and Machine Corp., Lynchburg, Va. or the address below.

Philadelphia Gear Works, INC.



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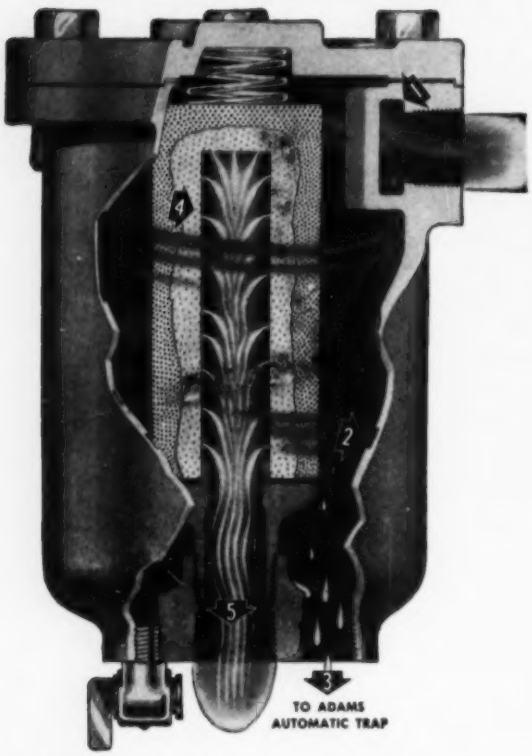

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1. Centrifugal separation of dirt and liquids.
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5. Clean, dry air at practically unchanged pressure. Standard, stocked sizes handle from 10 to 700 cfm.

Easily installed in either vertical or horizontal pipe line.

* *AFTERCOOLER AND CYCLONE SEPARATOR*

Cools air to within a few degrees of cooling water, making certain that compressed air is colder than surrounding atmosphere, so that no further condensation can take place.

Counter flow, air-through-tube design assures continuously high heat transfer rate.

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Why LINK-BELT belt conveyors are first choice in so many power plants . . .

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EFFICIENCY in moving materials makes the difference between profit and loss in many operations. That's why it's so important to make sure you get the *right* belt conveyor system for your needs.

And there's no surer way of meeting your specific operating requirements than by calling in Link-Belt. Our belt conveyor specialists can efficiently engineer the system and recommend the correct components from Link-Belt's complete line of idlers, trippers and terminal machinery. And Link-Belt can match your needs in associated equipment—other types of conveyors, feeders, elevators, car dumpers and shakers.

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LINK-BELT Roller Bearing Idlers provide free-rolling, long life

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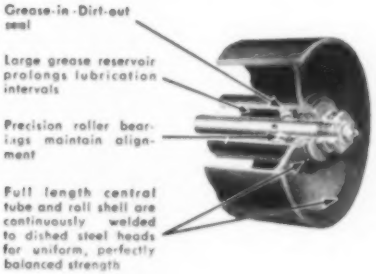
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Large grease reservoir prolongs lubrication intervals
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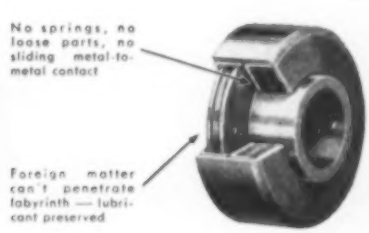
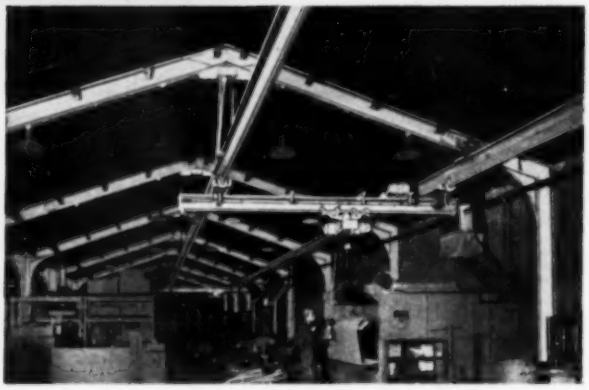
Less lubrication and adjustment


No springs, no loose parts, no sliding metal-to-metal contact
Foreign matter can't penetrate labyrinth — lubricant preserved

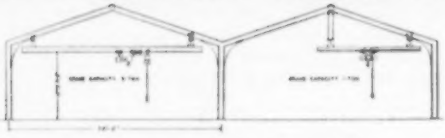
Grease-in-Dirt-out Seal

Photos courtesy of The Thew Shovel Co., Lorain, Ohio.

Rigid frame structure by The Steelcraft Mfg. Co., Rossmoyne, Ohio.



AMERICAN MONORAIL EQUIPS RIGID FRAME BUILDINGS



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Don't let crane requirements stymie your consideration of rigid frame buildings. Packaged buildings not only provide definite savings in construction costs and erection time but can be equipped with crane service over the entire area. American MonoRail cranes up to 5-ton capacity are available for entire span or half span operation. If you are planning plant expansion and considering rigid frame type construction, be sure to include American MonoRail cranes. Our engineers will gladly consult with you and show you cost and space saving advantages, in addition to original installation savings.

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THE NEW
LUNKENHEIMER
VALVE
HANDWHEEL

"non-slip"*
for positive closing

This revolutionary "Non-Slip" Handwheel introduces another Lunkenheimer improvement! Four rounded, non-slip lugs are gripped comfortably and firmly —operator's hand can't slip, even when wet or greasy. Result: Ordinary hand leverage closes the valve tight.

The new "Non-Slip" Handwheel is cooler, too—and keeps the operator's hand away from the top of the stem, which may be hot. It's sturdier, easier to operate, and makes your valves last longer.

WRITE FOR the name of your nearest Lunkenheimer distributor. He can show you samples of Lunkenheimer Valves with the new "Non-Slip" Handwheel. See them for yourself — *test them.* The Lunkenheimer Company, Box 360-EE, Cincinnati 14, Ohio.

*Patent Pending

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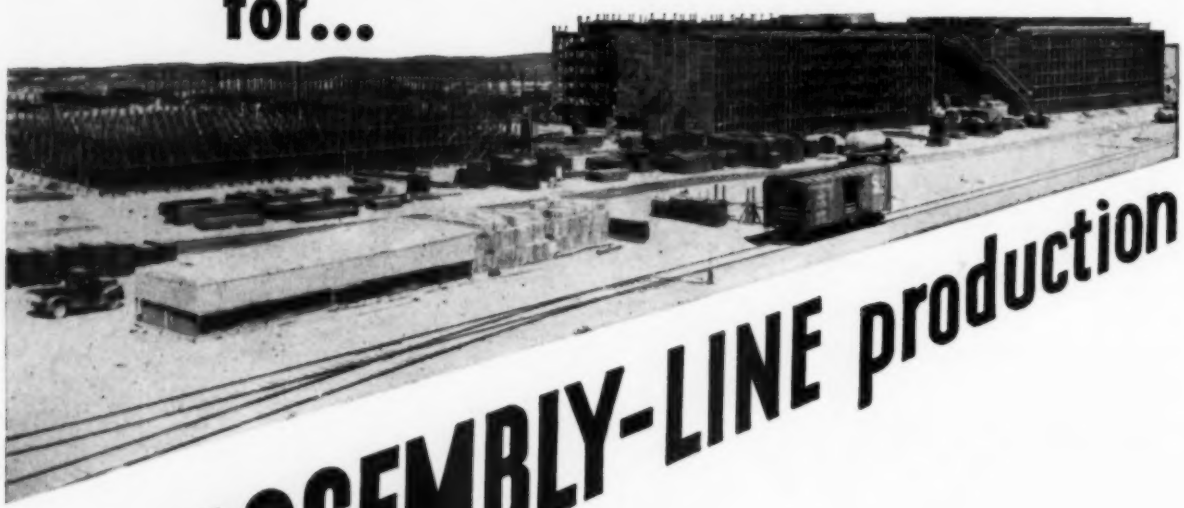
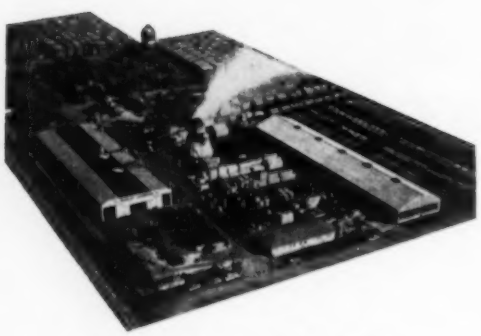
look to MARLEY for...



...ASSEMBLY-LINE production of Giant Cooling Towers



Marley Company plant at Stockton, California—the world's largest prefabricating plant for production of water cooling towers.

At Stockton, California, the Marley Company operates the largest specialized manufacturing plant in the world for prefabricating cooling tower lumber. Here millions of feet of redwood are prefabricated with assembly-line speed, made possible by the most modern equipment and manufacturing techniques.

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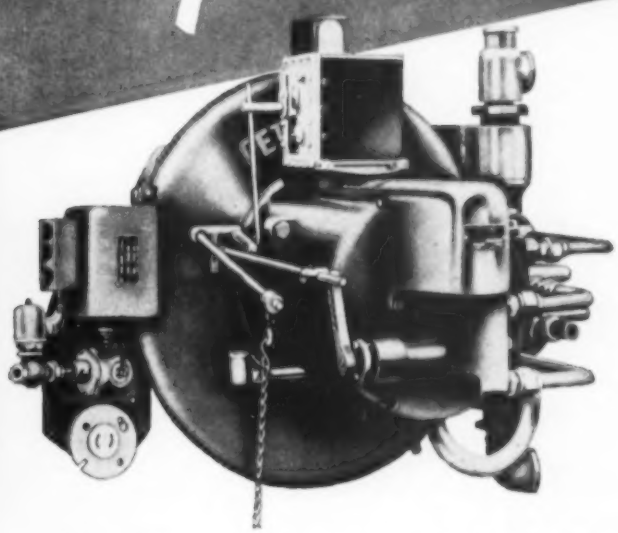
If you need large water cooling towers, and want to get them into service as quickly as possible, call on the Marley Company. You'll enjoy all the advantages of Marley's "custom-built" engineering, combined with assembly-line methods—advantages that have made Marley the world's leading producer of water cooling towers.

MARLEY

The Marley Company

Kansas City 5, Missouri

Have you a steam problem?



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Petro industrial oil burners are your best buy! They operate with high efficiency in practically every type of boiler.

Petro oil burners have world-wide acceptance. Their dependability is traditional. They are recommended by leading heating contractors everywhere. Fifty years in oil firing gives the Petro organization an exceptional degree of engineering experience and practical "know how."

Petro's outstanding ability to burn heavy, low-cost oils with maximum efficiency has reduced fuel costs in thousands of plants and buildings.

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You need to CUT STEAM COSTS

A Petro industrial oil burner will do it! The Petro burner is designed to burn low-cost heavy fuel oil with high efficiency and complete reliability. Saves money year after year.

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You need to do all this AT LOW COST without replacing your present boiler equipment.

INDUSTRIAL, COMMERCIAL and RESIDENTIAL OIL BURNERS FOR EVERY FIRING NEED

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Complete Seating Contact!

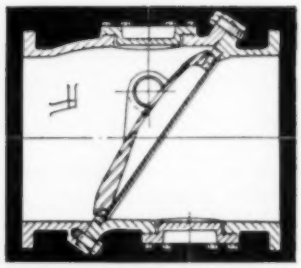
You know you've got it with . . .

CHAPMAN

Exclusive TILTING DISC *Check Valve*

Nothing can "unseat" the disc-ring of this valve from its *drop-tight* contact with the body-ring . . . because clearance at the hinge-pins means that this contact is *complete.* There is no sliding action, consequently no wear, no leakage. And the pivoted disc is cushioned to an easy, silent closing . . . without slam . . . in installations that don't have unusual piping arrangements.

What's more, hydraulic laboratory tests at a top engineering school prove that the specially designed disc and streamlined valve-body reduce head loss as much as 80% under conventional swing-type check valves. See the graphs of these tests . . . and illustrations of the unique construction features of Chapman Tilting Disc Check Valves . . . in Catalog No. 30 (yours for the asking). *Write.*



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS

Timely Comments

TECHNICAL REFERENCE DATA

EACH FEBRUARY, for many years, SOUTHERN POWER AND INDUSTRY has presented its annual Technical Reference Issue—an issue composed largely of technical articles containing engineering reference data of lasting value. The same procedure is followed in this issue, but we feel impelled to qualify the statement "lasting value."

Advances are continuing at such a rapid pace, we are doubtful if any data now presented can be expected to continue useful for a very long time. We feel that current technical literature should be continually searched for newer and better methods. No engineer should depend on data even a year old without due consideration of possible changes and improvements. That is the principal advantage technical "monthlies" have over "standard reference volumes."

Particularly in the past few years, a reference book tends to become obsolete before its reference data can become "standard." Magazines, on the other hand, deal extensively with material that is not yet thoroughly proven. So magazines and reference volumes serve better jointly than singly. Engineers can depend on magazines for new ideas and trends, but frequently thorough checking by the more conservative textbook methods can avoid going overboard on something new that may not stand the test of time. As always, engineers must depend largely on their own resourcefulness and good common sense to develop economical, workable procedures. Seldom indeed can they copy directly from any technical source to solve completely their own plant problems.

The feature article in this issue describes a large new power plant operating on the reheat cycle: Actually, there are three turbines on one shaft: high pressure, reheat, and condensing. Data presented is now more or less "conventional," but still so new that relatively few such large units are in service.

An article on air preheater design and maintenance discusses current practices. But the pressures and temperatures considered have only been employed the past few years.

Scale Formation and Removal gives "current practices"—but the reader should remember that present theories on boiler scale and corrosion are all relatively new and accepted practices today may be obsolete tomorrow. The whole subject of corrosion and electrolytic action is undergoing such thorough study, we may rest assured new answers are on the horizon.

An article on field vulcanizing of large conveyor belts is presented in spite of the fact that the editors' survey indicates men in the plant are not yet ready to accept this method.

Banning the By-Pass may raise some discussion, because, as the author says, "the crank continued sometime after the self-starter was invented." But the article will make designers think—and perhaps we are hanging on to some safeguards long after their need has been eliminated by better equipment.

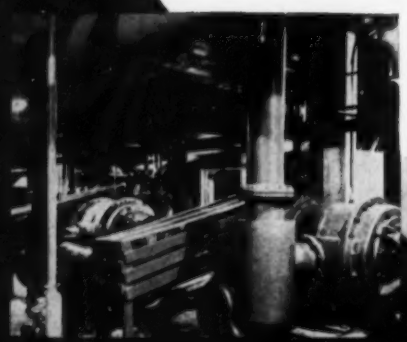
Other subjects that tempted the editors were: Atomic Power, Synthetic Fibers, New Adhesives, and Protective Coatings—but trying to tabulate "Technical Reference Data" on these subjects seemed a bit premature. Before 1953 ends such tabulations would be inadequate and misleading. Developments in these lines are taking place so fast that they may only be treated one by one and month by month as the researchers' dreams come true.

Two new building procedures now simmering in the editorial pot are: soil stabilization by mechanical compacting; and erecting concrete structures by use of hydraulically operated forms.

Troubles may develop, and more research may be required but these look like "standard procedures" of the future.

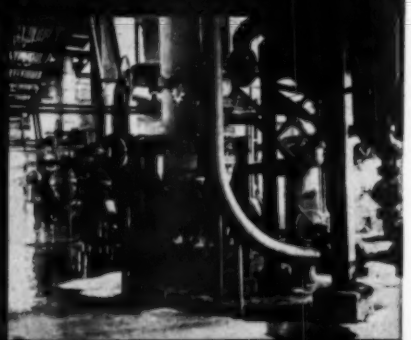
So call February a Technical Reference Issue if you like, but use it intelligently and watch each month for the changes and new developments that are just as sure as taxes, and no more stable than political promises. Your editors will try to continue down the middle of the road and give you as much of the new as can be accepted, but always encouraging use of past experience as a check.

PAPER MILLS, TOO, need plenty of PIPING

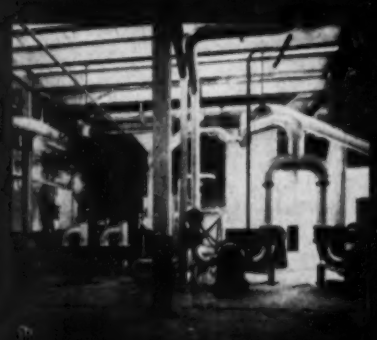


Vacuum Pumps

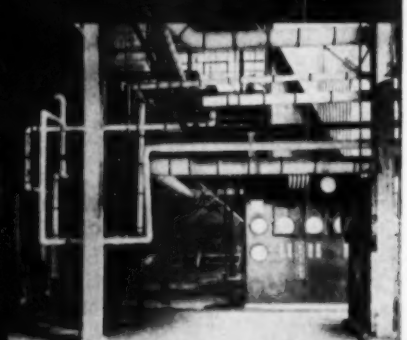
Drive Side of Paper Machine



Digester Room



Condenser in Main Turbine Room



Fuel Oil Piping to Back Burner

A quick trip through any paper plant will show that there's a lot of piping of all types back of every ton of paper produced. High pressure steam lines, vacuum lines and various process lines in this mill must function with complete dependability to avoid costly shutdowns . . . so the management specified Blaw-Knox piping throughout. They recalled Blaw-Knox skill and experience in fabricating piping for a great variety of industrial plants and utilities, both here and abroad. You can benefit equally on your next piping job. Say where—Blaw-Knox will be there.

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POWER PIPING AND SPRINKLER DIVISION

BLAW-KNOX COMPANY

Pittsburgh 33, Pa.

BLAW-KNOX POWER PIPING

Industry Speaks

ATMOSPHERE . . . no longer for waste disposal

Adapted from comments by *Bert S. Norling*, power design engineer, *E. I. duPont de Nemours & Company*, at the annual meeting of the A.S.M.E. in New York.

UNTIL recent years, the atmosphere was considered a natural means of waste disposal. Almost without exception industries discharged their furnace gases with all the products of combustion into the atmosphere. With the increase in population and concentration of industry, this practice cannot be continued without deleterious effects. The installation of fly-ash collectors and the disposal system for a large existing industrial plant, show the problems involved.

A survey was made to determine the plant's contribution to the conditions causing the nuisance. Tests were run to determine the fly-ash emission rates from the power house stacks. At the same time, the downwind concentration of fly-ash at ground level was also measured. The fly-ash concentration at ground level was found to be from two to seven times in excess of values normally considered to be acceptable. The decision was then made to proceed with the installation of collectors.

Selection of Collectors

There were numerous commercial collectors available from which to choose for this installation. The range in available collection efficiency approaches nearly complete removal of the last traces of ash, but, with the more thorough clean-up comes a rapid rise in cost. Another limitation was the space available, since no provisions had been made originally for the installation of collectors and this too increases the cost of the installation.

The question that naturally arises then is, what collection efficiency is required? This is a difficult question. A heavy capital investment will cut deeply into the profitable operation of the plant, since power costs must be included in the cost of the manufactured product with no assurance that the product sale price can be increased to cover the additional investment. At present, the collected fly-ash cannot be considered as salable. There will be some return through reduced induced draft-fan maintenance but this is more than offset by the addition of operating and maintenance of the collector installation. The installation of fly-ash collectors and the facilities for disposal become a costly burden on the operation of the plant. Nevertheless, abatement is a plant responsibility and good community relationship is the compensating return.

There were no local ordinances establishing the required collection efficiencies or limiting emission rates. Lacking any such mandatory regulation, the model ordinance suggested by the ASME was used as a guide, for it is generally accepted and is one of the more stringent ordinances. The ASME Code requires that the dust loading of stack gases shall not exceed 0.25 grains per cubic foot with the exception that a collector efficiency of not more than 85 per cent is required for new plant installations and not more than 75 per cent for plants constructed prior to the effective date of the ordinance. The ordinance in the nearest city is far more lenient than the ASME Code. The atmospheric dust loading, at ground level downwind from the stack, was expected to be reduced to less than 0.55 grains per 1,000 cubic feet as this figure is considered as acceptable in a normal city. Collectors with an average efficiency of 85 per cent or better would then be expected to give the required clean-up. On this basis the mechanical collectors were accepted.

A mechanical collector does not give a clear gas leaving the stack. The very fine particles that remain give color to the gases; and, if there is a high carbon content in the particles, then the appearance of the discharge gases will be dark, even though the dust loading of the gas is light. The color of the gases leaving the stack, though it was carefully considered, was not a determining factor. After the completion of the installation of collectors at this plant, a local civic organization voluntarily wrote a letter to the company expressing their appreciation and specifically stated that there was no longer a dust nuisance in the community.

The efficiency of the mechanical collector drops off rapidly as the particle size decreases below ten microns—one 25 hundredth of an inch (1/2500 inch).

Types of Collectors

The mechanical collector has in general been a lower cost installation than the electrostatic precipitator and it has been used more widely in the industrial plants. It does not give the clean-up that is possible with the electrostatic precipitator. If the electrical characteristics of the ash are not suitable, the precipitator may also give a performance far below that expected. There seems to be a field for each type. At present, a combination of the two types appears to overcome many of the limitations. However, cost and space prohibit the use of the combination on most existing boiler plants. The higher efficiency mechanical collectors limit the fly-ash emission rate sufficiently to meet nearly all of the existing ordinances except the APCA ordinance applied to large plants.

Southern Utilities Build for Future

Confidence that Southern progress will continue at a high level is evident from an announcement that private electric utility firms are investing approximately $5 billion in new facilities to provide adequate power for industrial and residential growth during the 1946-56 decade.

M. L. WILSON
Chairman of SASI Fact Finding Group

The SASI is a non-profit, non-political organization founded in 1941. It maintains a central research office in Atlanta under Director H. M. Conway, Jr. Membership is open to individuals, institutions, business firms, and organizations.

ACCORDING to a recent report prepared by Southern Association of Science and Industry, Southern utilities plan to add 6,452,000 kw of new generating capacity during the next three to five years.

"The major conclusion of our report is that the electric utilities of the South are alert to the opportunities of the region and are making every effort to take advantage of them," stated M. L. Wilson, chairman of SASI fact-finding group. Mr. Wilson, industrial engineer for the Georgia Power Company in Atlanta, is a veteran of 25 years' experience in locating new industries in the South.

Pointing out that Southern electric firms are adding new capacity much more rapidly than are utilities in other areas, Mr. Wilson said, "there is no doubt that industrial progress and electric service expansion go hand in hand. The multi-billion dollar expansion programs of the power generating companies in the South have been a vital force in recent economic advancement of the region."

A particularly impressive fact uncovered by the SASI survey is the number of complete new generating units built in recent years and planned for the immediate future. A total of 86 units were added during 1946-51 and plans have been laid for 60 more during 1951-56. Many of these units cost $20 million or more and constitute a major resource in the sections in which they are located.

The study was conducted by the SASI Committee on Electric Utilities. Data available from such sources as Edison Electric Institute and the National Association of Electric Companies was supplemented by information supplied within the past few weeks by committee members. All major private electric utilities in the 14 Southern States were invited to provide information for the report. But data had not been received from several companies at the time the report was prepared.

It will be realized, of course, that the figures covering the expenditures for the future are estimates only. However, it is believed that most of the estimates are conservative. Moreover, some firms provided estimates for five years in advance whereas others predicted only for three years.

The large tabulation on opposite page gives information furnished by Southern private electric companies showing actual expenditures for 1946-51 and anticipated expenditures for 1951-56 for new facilities. It is significant here that major Southern utilities expect to invest about as much in new facilities during the next five years as they have during the previous five, which was a period of remarkable growth.

The leading firms expect to in-

South Compared with Other Regions

TO PROVIDE A COMPARISON of Southern private electric utility growth with other regions of the country, the SASI report made use of the data compiled by Edison Electric Institute for the period 1946-54. The Edison figures given here are not directly comparable with the SASI data on opposite page because the period covered is different; and as pointed out in the SASI report, its tabulations lists only that data actually presented by the individual companies, and does not include any estimates for companies and plants not represented in statements received.

Data from Edison Electric Institute 1946-54
Estimated Expenditures in $ Millions

SOUTH—(14 states included in the SASI Report)	4785
NEW ENGLAND—(Me., N. H., Vt., Mass., R. I., Conn.)	885
MIDDLE ATLANTIC—(N. Y., N. J., Pa.)	3120
EAST NORTH CENT.—(O., Ind., Ill., Mich., Wis.)	4275
WEST NORTH CENT.—(Minn., Iowa, Mo., N. D., S. D., Kan.)	1575
ROCKY MOUNTAINS—(Mon., Id., Wy., Colo., N. M., Ariz., Utah, Nev.)	720
PACIFIC COAST—(Wash., Ore., Cal.)	2105

The above tabulation shows total expansion in the Southern States, 1946-54, will be nearly $5 billion. The total for New England is less than $1 billion, and expansion in one Southern state (Texas) is greater than for all New England. Likewise, Southern expansion is greater by nearly $2 billion than in the Middle Atlantic States. Also, the total for the Southern States exceeds that for the East North Central group.

vest a minimum of $1.91 billion during the next five years as compared with $2.24 billion during the past five, making a total of $4.15 billion for the decade. Similarly, they expect to add 6,452,000 kw of capacity during 1951-56 as compared with 6,782,000 kw during 1946-51, giving a total of 13,234,000 kw added during the ten year period. Moreover, Southern utilities expect to build at least 60 new generating units by 1956, giving a minimum of 146 new units for the 1946-56 decade.

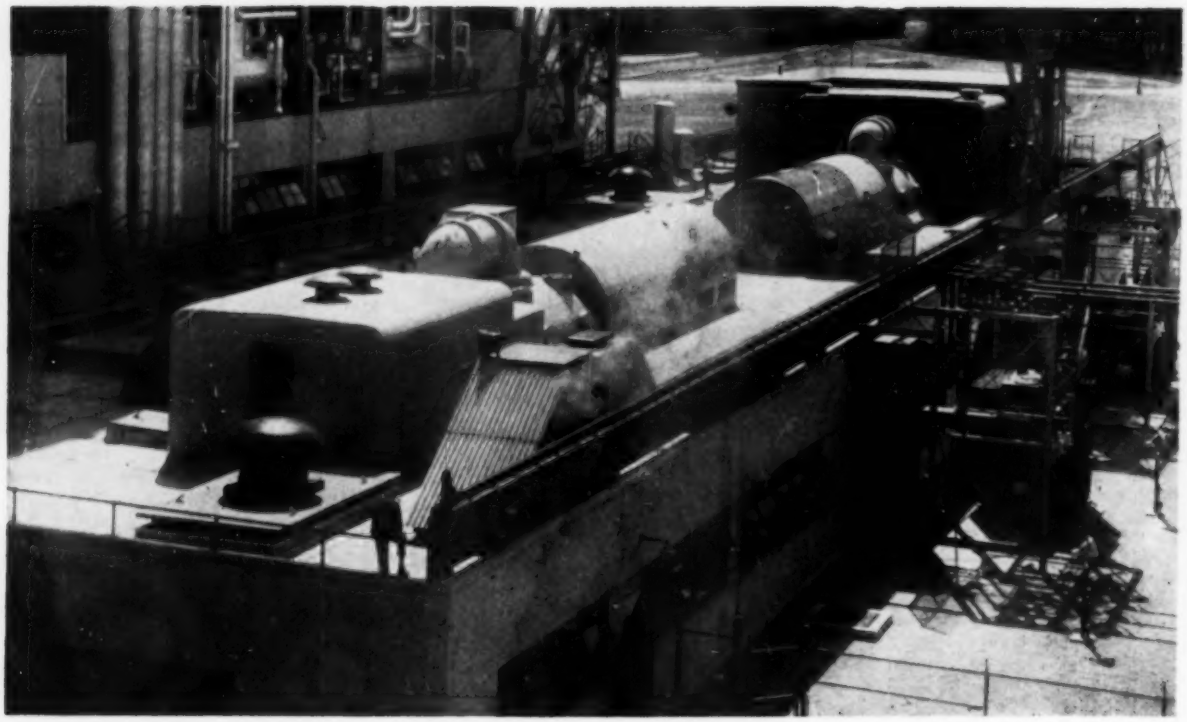
Most of the new generating facilities are steam plants using coal, oil, or gas as a fuel. Hydroelectric plants account for only a small proportion of total expansion. The electric generating stations and principal load centers of the South are interconnected by a network of high voltage transmission lines. Thus, the operations of the various systems are integrated for maximum service efficiency.

The major conclusion of the report is that the private electric utilities of the South are alert to the opportunities of the region and will be prepared to supply its power.

Expansion of Major Private Electric Utility Systems in South 1946-1956

		Investment (Millions $)			Capacity (thousands kw)		
State	Company	1946-51	1951-56	Total	1946-51	1951-56	Total
ALA.	Ala. Pow. Co.	165	115	280	435	400	835
ARK.	Ark. P&L Co.	94	104	198	348	524	872
FLA.	Fla. P&L Co.	113	147	260	361	321	682
	Fla. Pow. Corp.	55	67	122	161	212	373
	Gulf Pow. Co.	31	17	48	53	80	133
	Tampa El. Co.	32	60	92	90	160	250
	Total	231	291	522	665	773	1,438
GA.	Ga. Pow. Co.	192	121	313	610	300	910
	Ga. P&L Co.	9	10	19	7	...	7
	Sav. E&P Co.	8	10	18	20	20	40
	Total	209	141	350	637	320	957
KY.	L'ville G&E Co.	45	50	95	250	200	450
	Ky. Util.Co.	23	32	55	165	225	390
	Total	68	82	150	415	425	840
LA.	La. P&L Co.	55	...	55	175	135	310
	N. O. Pub. Serv.	41	33	74	133	82	215
	SW G&E Co.	49	53	102	140	160	300
	Total	145	86	231	448	377	825
MD.	Con. Gas El.	88	100	188	301	200	501
	Pot. Ed. Co.	48	19	67	154	...	154
	Total	136	119	255	455	200	655
MISS.	Miss. P&L Co.	65	52	117	209	200	409
	Miss. Pow. Co.	27	22	49	107	60	167
	Total	92	74	166	316	260	576
N. C.	Car. P&L Co.	102	121	223	279	210	489
	Duke Pow. Co.	180	120	300	720	550	1,270
	Total	282	241	523	999	760	1,759
OKLA.	Okla. G&E Co.	86	55	141	221	90	311
	Pub. Serv. of Okla.	57	72	129	167	120	287
	Total	143	127	270	388	210	598
S. C.	S. C. El.&G. Co.	57	66	123	85	250	335
TENN.				Federal Power			
TEX.	Cent. P&L Co.	71	83	154	100	210	310
	Gu. St. Util.	119	79	198	270	260	530
	Houston L&P	106	...	106	325	675	1,000
	Tex. El. Serv.	95	153	248	346	450	796
	Total	391	315	706	1,041	1,595	2,636
VA.	Va. E&P Co.	225	150	375	550	358	908
TOTAL		2,388	1,911	4,149	6,782	6,452	13,234

Note: A few companies did not reply, some omitted data as indicated by (—) in the tabulation, and some predicted expansion for only three years instead of five. The totals shown here are merely the sums of data presented and no effort was made to compensate for missing data. Therefore the totals shown are less than would result from complete data.



General view of Goldsboro station of Carolina Power & Light Company. A close-up of the reheat turbine is shown on opposite page.

REHEAT CYCLE for

By JAMES A. JONES

Senior Engineer
Carolina Power & Light Company
Raleigh, North Carolina

ANOTHER milestone in the $150,000,000 post-war expansion program of the Carolina Power & Light Company was reached when the second generating unit began commercial operation at the Goldsboro Steam Electric Plant on June 13, 1952.

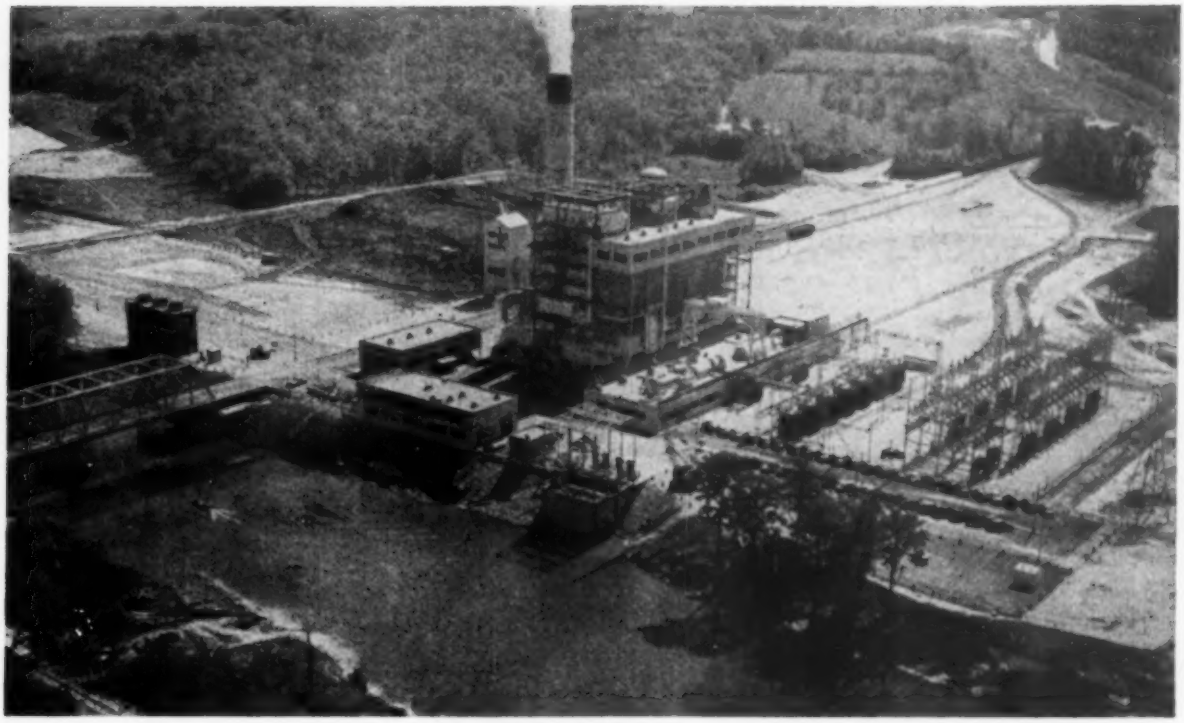
Thirteen months previously, the first unit was placed in service. Since the first constructed unit is designated the No. 2 unit, misunderstanding has resulted with persons not familiar with the plant because we call the newer unit No. 1. There is a good reason, however, for this sequence.

Certain features of the plant were laid out for four machines. The coal handling equipment was designed for a future capacity to serve all four units. It was decided, therefore, to have the coal conveyor from the crusher house to the bunker bay terminate in the center of the future four-unit plant. Since the plant is laid out for expansion at a right angle to the river, and since it was planned to install both circulating water tunnels simultaneously, it was more economical to construct the unit located in the No. 2 position first than to bridge across the site for the No. 2 unit to reach the No. 1 unit with the coal conveyor.

The plant is located on a 900-acre tract of land on the south bank of the Neuse River approximately five miles west of Goldsboro, North Carolina. The main plant site is situated within a large bend in the river across which a 4200 ft long discharge canal was excavated. This canal returns the condenser circulating water back to the river five miles downstream from the plant, and serves as a flood bypass during periods of unusually large river flow. A 6.5 ft high submerged weir-type reinforced-concrete dam was constructed across the river channel below the discharge canal to maintain the water elevation in the channel high enough to obtain recirculation during periods of low river flow.

Semi-outdoor design

This plant is of the semi-outdoor design, with much of the major equipment exposed to the weather. In fact, all of the steam generating



The reheat turbine is installed on deck which serves as roof of the main station building—see general view of plant on opposite page.

GOLDSBORO UNIT

Carolina Power & Light Company's newest generating unit features: reheat cycle, outdoor installation, and special arrangement of control panels.

equipment except the coal conveyor and the coal pulverizers is located outdoors. Also, the turbo-generators, except for a small steel enclosure at the head end of the turbines, are on an open deck. The turbine deck serves as a roof for the main station building. The condensers, boiler feed pumps, switchgear, condensate pumps, feedwater heaters, and minor auxiliaries are located in this building. Access to most of this equipment with the forty-ton Gantry crane is possible through strategically located removable hatches.

The control room, located on the end of the turbine deck beyond the No. 2 unit so as to be centrally positioned with a four-unit plant, is enclosed on two sides with 8 in. concrete walls, on one end with a Thermopane window, and on the other end with a temporary corrugated transite wall. The conveyor room over the bunkers is also enclosed with corrugated transite. The only enclosure on the boiler operating level is a small room containing instrument transmitters and a desk for the auxiliary operator.

A two-story office and service building, constructed of steel and concrete, is located adjacent to the river. This building contains the general office, superintendent's office, assembly room, first aid room, laboratory, and machine shop.

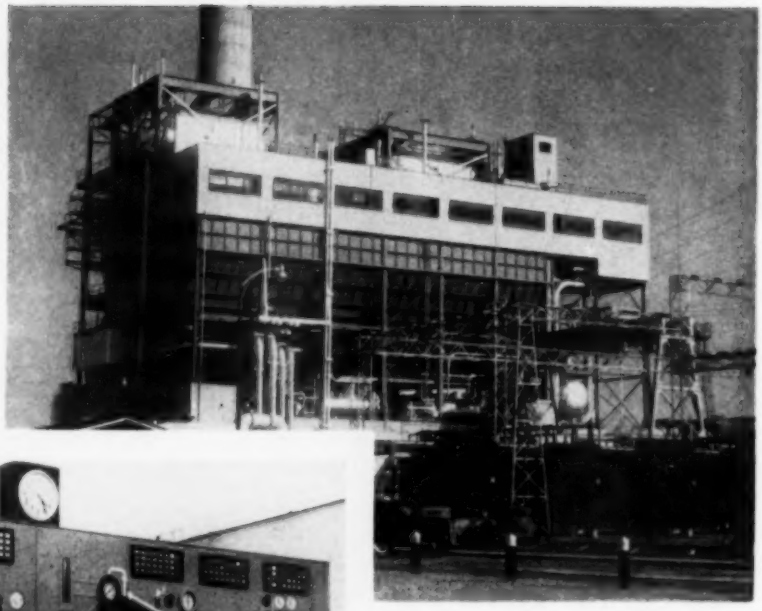
Other buildings consist of a 40 x 60 ft corrugated asbestos warehouse; a chlorine cylinder storage shed; a hydrogen and miscellaneous gas storage building; a water treatment building; and a 40 x 50 ft open-type shed for the truck, bulldozer, and carryall.

The foundation investigation revealed that it would be necessary to set a part of the plant on piles. The station building sits on a 4½ ft reinforced concrete mat. On top of this mat is a 3½ ft sand fill and a 1 ft concrete basement floor slab. The 28 ft high reinforced concrete turbine pedestal rests on the basement mat. The foundations for the pulverizer bay and the steam generator are supported by cast-in-place concrete piles.

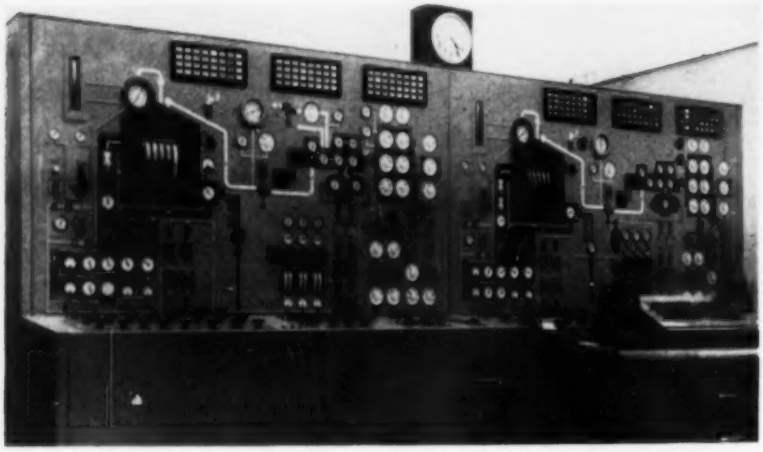
Turbo-Generator

The No. 1 turbine is a Westinghouse outdoor 50,000-62,500 kw tan-

dem compound, two cylinder, 3600 rpm, high pressure impulse-reaction type, condensing, reheat machine. It is designed for a regenerative feedwater cycle with six extraction points provided, five of which are utilized. The design steam conditions are 1450 psig and 1000 F at the throttle with reheat to 1000 F. This turbine drives a 3-phase, 60-cycle, 3600 rpm, 13800 volt, 0.8 pf, hydrogen-cooled generator. At 0.5 hydrogen pressure this generator is rated at 60,000 kw and 75,000 kva; at 30 lb it is rated at 75,000 kw and 93,750 kva.



All of the major steam generating equipment except coal conveyors and pulverizers is located outdoors



Equipment on the boiler and generator control board is carefully arranged to aid in apprentice training program, and to concentrate all controls at one location.

Since experience has shown that the actual capability of turbines at full throttle flow exceeds the name plate ratings, the steam generator and all auxiliary equipment were designed on the basis of the expected capability of the turbine at full throttle flow.

High pressure, superheated steam from the boiler flows to the high pressure section of the turbine, from which it is returned to the reheater section of the boiler. There it is reheated to initial temperature and delivered to the reheat turbine section—and then to the low pressure turbine section (see Flow Diagram).

Steam Generator

Steam for the turbine is furnished by one Combustion Engineering, outdoor, radiant type, reheat steam generator. This steam generator is designed for a steam flow of 550,000 lb/hr at 1550 psig and 1005 F at the superheater outlet and a flow of 495,000 lb/hr at 446 psig and 1005 F at the reheater outlet when supplied with feedwater at 463 F.

The furnace is designed for a heat liberation rate at 550,000 lb/hr flow (18,600 Btu/hr/cu ft), or 93,500 Btu/hr/sq ft projected water wall surface.

The steam generator is guaranteed to have an efficiency of not less than 89.58% with an exit gas temperature of 273 F when producing steam at the rate of 500,000 lb/hr and burning a bituminous coal of the following analysis: carbon 79.7%, hydrogen 5.0%, oxygen 6.4%, nitrogen 1.6%, sulphur 1.0%, ash 6.3% heating value (high) 13,800 Btu/lb, ash softening temperature 2100 F, grindability 80 Hardgrove.

At full boiler load approximately 53,000 lb/hr of coal of the analysis specified in the guarantee is required. This coal is supplied to the twelve tangential burners by three Raymond Bowl Mills each designed to deliver 24,000 lb/hr, of which 70% will pass through a 200 mesh screen, 92% through a 100 mesh screen, and 99% through a 50 mesh screen provided the coal is fed to the mill in sizes not exceeding ¾" and the moisture not exceeding 12%.

The heat exchange surfaces of the steam generator are cleaned by ten retractable IK and eight IS Diamond automatic sequential air-operated, air-blowing sootblowers. The two air heater cleaning devices, installed in the gas side of the air heater discharging counter to the gas flow, are also tied in with the automatic sequential system.

Air is supplied to the furnace by two Green Fuel forced draft fans with inlet vanes and outlet dampers to regulate the flow. This air is heated before entering the furnace by two Ljungstrom vertical type, top-supported, center-driven, cold-end basketed preheaters. The min-

imum allowable cold-end temperature is normally maintained by a recirculating duct and under extreme conditions by both a recirculating duct and a by-pass duct.

The products of combustion are removed from the furnace through a Pratt-Daniel tubular dust collector, with an efficiency of 85% based on dust consisting of not more than 28% under ten microns in size, by two Green Fuel constant speed induced draft fans. The gas flow through these fans is regulated by inlet vanes and outlet dampers.

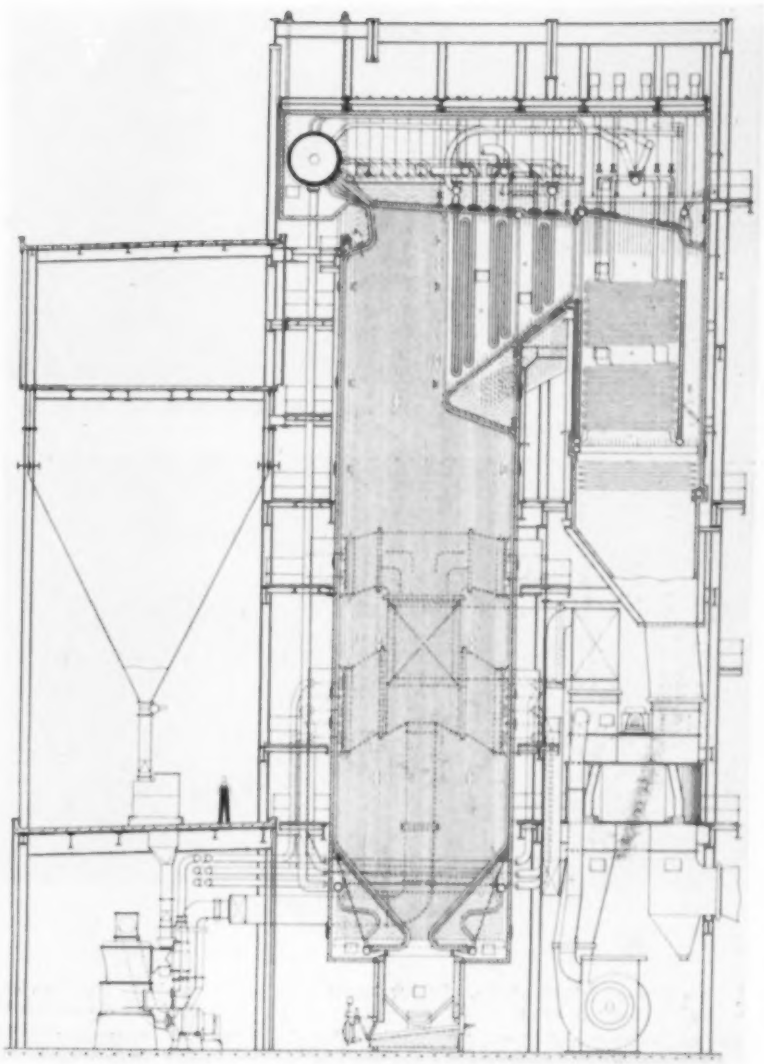
The induced draft fans discharge to a brick-lined reinforced concrete stack built to serve both Units 1 and 2. This stack, erected by the Custodis Construction Company, is 16 ft inside diameter and 200 ft high. It is erected on a cast-in-place concrete pile supported reinforced concrete mat foundation.

The ash is removed from the Allen-Sherman-Hoff dry type ash hopper, through a 20 in. clinker grinder, by a United Conveyor Hydraulic Conveyor system which deposits the ashes in a 50-acre area east of the plant set aside for this purpose.

Combustion and Feedwater Control Equipment

Equipment has been provided for complete automatic operation of the steam generator. The pneumatic combustion control, furnished by the Hagan Corporation, is designed to maintain steam pressure at a constant value by adjustment of the fuel firing rate, to control air flow in the correct ratio to the steam flow by positioning the inlet vanes and under low loads the outlet dampers of the induced draft fans, and to maintain constant furnace draft by positioning the inlet vanes and under low loads the outlet dampers of the forced draft fans.

On other steam generators on the system the practice has been to meter the air flow by totalizing the gas flow in two parallel lanes in the rear pass of the boiler. Since this method has not proven satisfactory because of slag accumulation causing varying differentials and thereby complicating the problem of calibrating instruments, several other methods of measuring air flow were studied. In every method considered there were disadvantages; but in the method finally adopted, the disadvantages seemed to be the least serious.

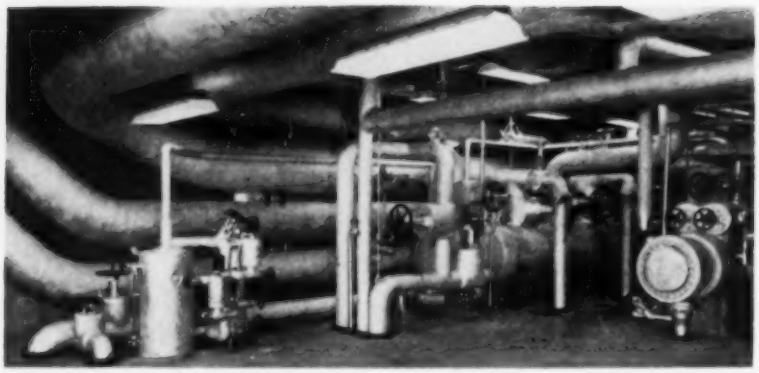


Sectional view of steam generating unit.

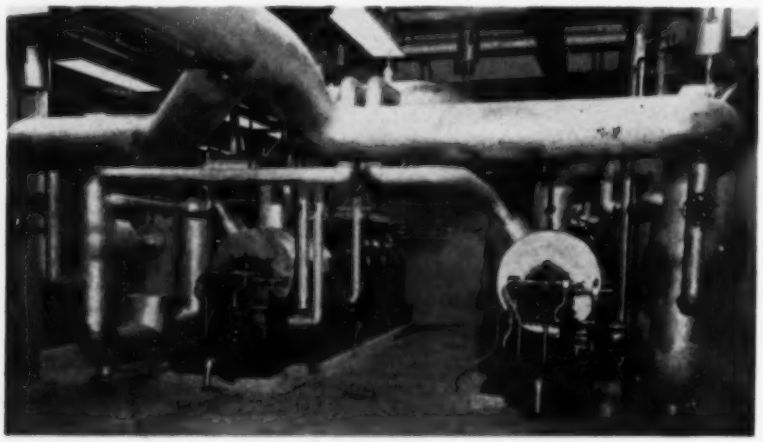
Air foils designed for two inches water maximum differential were installed in the horizontal sections of the hot air ducts between the air heaters and the wind box. Obviously, this arrangement does not provide for the measurement of the pulverizer tempering air, but this quantity is such a small percentage of the total air used that this omission is not considered serious.

Steam temperature is automatically controlled by Leeds and Northrup electric controllers connected to a damper, by-passing gas around the low temperature section of the superheater. This control is designed to hold the superheat temperature constant over a range of steam flow from 350,000 to 550,000 lb/hr. For emergency operation only, two desuperheaters are installed between the low temperature and high temperature sections of the superheater. These desuperheaters are not arranged for automatic operation since they are to be used only in case of an emergency.

Reheat temperature is also automatically controlled by Leeds and Northrup electric controllers ar-



Main steam reheat piping on left; high intermediate feedwater heater and air ejector to right.



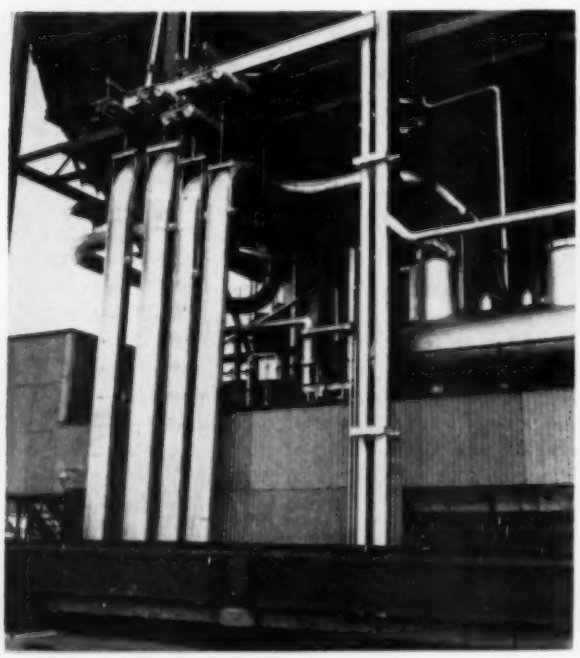
Boiler feed pumps for Unit No. 1.

ranged to operate the tilting burners. This control is designed to maintain a constant temperature over a reheater flow range from 360,000 to 495,000 lb/hr. Similar to the superheater, two manually-operated desuperheaters are installed in the reheater system inlet for emergency operation.

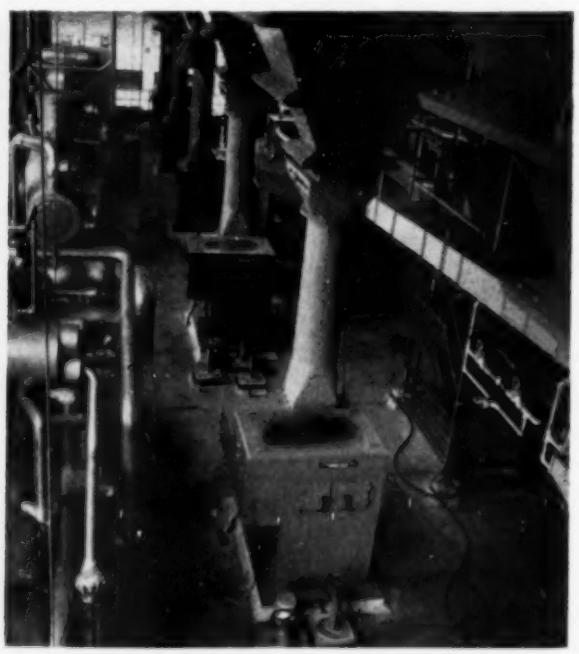
Feedwater is regulated by a Bailey three-element controlled feedwater valve. This automatic feedwater regulating valve is equipped with a motor-operated full capacity by-pass valve operative from the control room and a small hand-operated by-pass valve for starting.

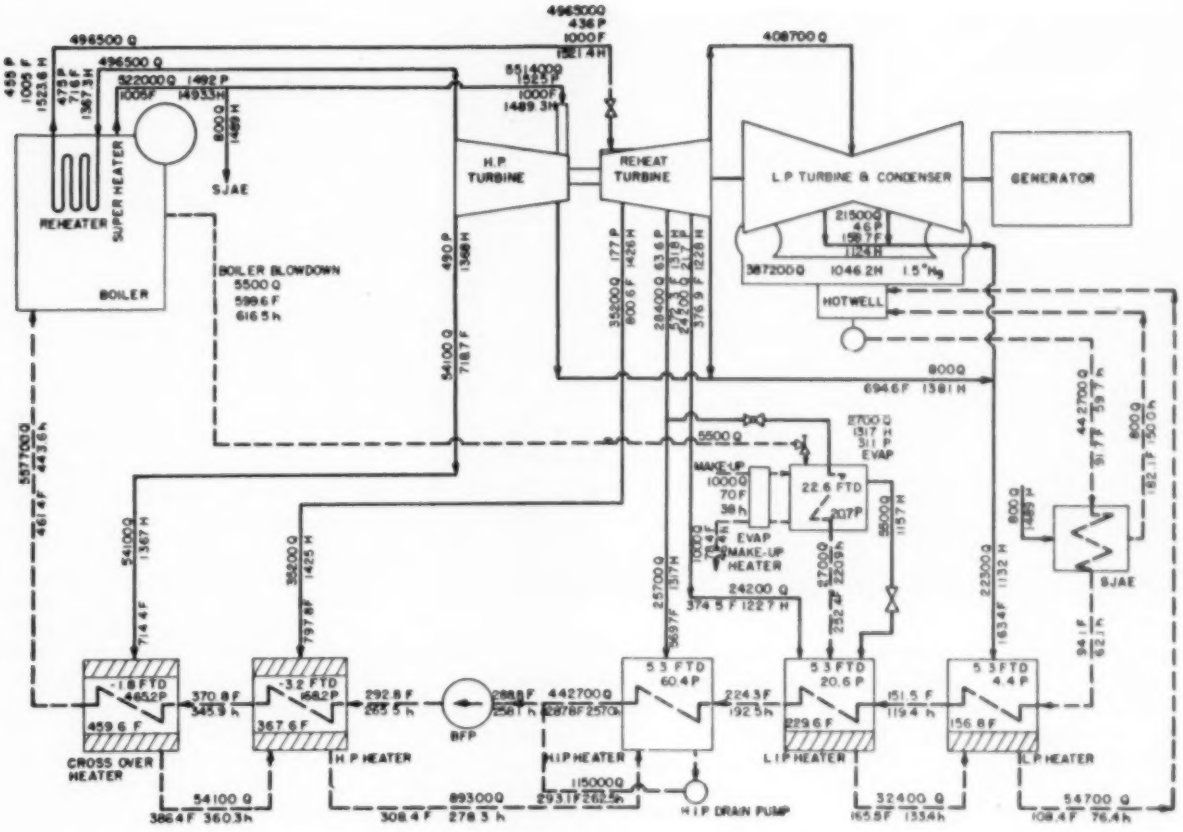
The concrete intake for the No. 1 unit was constructed simultaneously with the No. 2 unit intake. Water is taken from the Neuse River through Link Belt revolving water screens and a set of stationary screens by two 36 in. vertical, Ingersoll-Rand, mixed flow circulating water pumps. Each of these pumps is designed for a capacity of 23,750 gpm at 690 rpm against a total dynamic head of 45 ft. These outdoor pumps discharge into a reinforced concrete tunnel constructed for a water flow of 120,000 gpm serving both units 1 and 2.

Steam and reheat piping. Evaporator at right is on boiler operating level.



The three coal scales farthest from the camera are on the newest unit.





Heat Balance Diagram for Goldsboro reheat unit.

The water is taken from the concrete intake tunnel through two 48 in. steel pipes to a Lummus, two-pass, divided water box surface condenser. This condenser contains 9100, ⅞ in. OD, 18 BWG arsenical copper tubes in muntz metal tube sheets. The water is discharged from the bottom pass through two 42 in. steel pipes to the reinforced concrete discharge tunnel which is also common to both units 1 and 2.

For the abatement of slime in this circulating water system, a Wallace and Tiernan semi-automatic, control solution feed, visible vacuum, chlorinator has been provided with a capacity of 6000 pounds of chlorine per 24 hours.

Coal Handling

Coal is brought to the plant site by both the Southern and Atlantic Coast Line Railroads. Access to the plant is over a river bridge jointly owned by the Railroads and Carolina Power & Light Company. Spurs for providing adequate coal car storage are provided across the river from the plant.

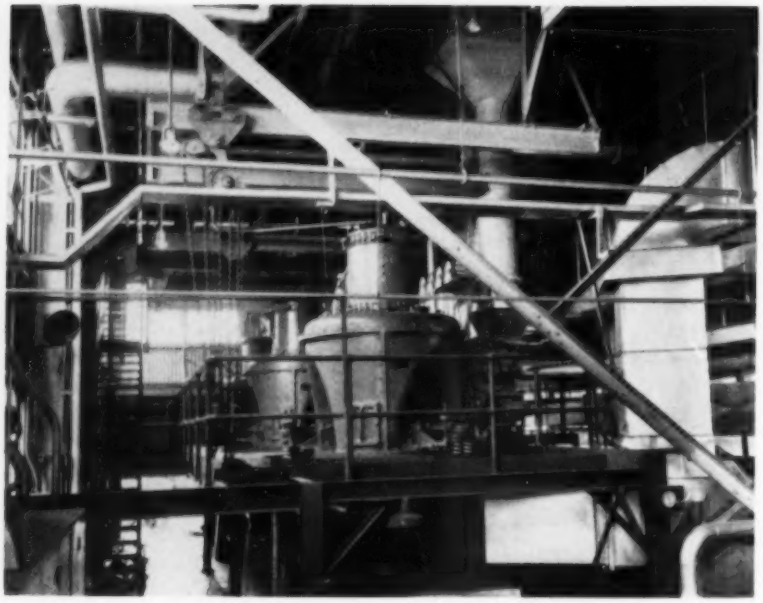
The coal cars are shifted as required by a 25-ton, 150 hp General Electric Diesel electric locomotive. Coal is unloaded from the cars by a shakeout into a hopper which is also used for reclaiming coal from storage. From this hopper the coal is conveyed on a 36 in. belt to the crusher tower located 280 ft north of the unloading pit. Here a magnet pulley is arranged to remove the tramp iron from the coal. In the crusher tower the coal is either by-passed around or passed through a 450-ton per hour crusher.

If the coal is to be stored, a belt carries it from the crusher tower to an area 400 x 500 ft which will accommodate approximately 100,000 tons of coal when piled 20 ft high. From the storage discharge chute, the coal is distributed on the pile either by a 130 drawbar horsepower bulldozer or a 12-ton capacity carryall, depending upon the distance the coal is to be carried from the chute.

If the coal is not to be stored, it is transported from the crusher tower to the bunker bay 225 ft away. Here the coal is distributed to the bunkers by a sealed type, self-propelled, dual discharge tripper conveyor. This tripper conveyor discharges into a 975-ton gross (810 tons net based on 50 lb/cu ft and 45° angle of repose) gunite lined bunker. This quantity of coal is adequate for thirty hours' operation at rated boiler capacity.

Coal flows from the bunker outlets to three Richardson automatic scales, which are designed for weighing and registering a maximum of 40,000 pounds of coal per hour with a weighing hopper capacity of 300 pounds. The coal is dumped from the scales into the pulverizer feeders. To aid the flow of wet coal, automatic vibrators are mounted on the coal pipes both between the bunkers and scales and between the scales and the pulverizer feeders.

The feedwater cycle consists of



Pulverizer Bay of Unit No. 1

a condenser with a deaerating section and five closed feedwater heaters—three on the suction side of the boiler feed pumps and two on the discharge side. Four of these heaters are equipped with drain coolers and three with desuperheating sections. The heater drainage and venting system is so arranged that all steam and water subjected to less than atmospheric pressure after leaving the condensate pumps are returned to the deaerating section of the condenser for the removal of oxygen before being injected into the boiler feedwater system.

Water is pumped from the 600 cu ft condenser hotwell by one of two full capacity Worthington horizontal condensate pumps through the steam jet air ejector condensers, the 33rd stage heater, the 30th stage heater, and the 27th stage heater into the boiler feed suction at 200 psig. From this point one of two full capacity Worthington barrel casing type boiler feed pumps delivers the water through the 21st stage heater and the 12th stage heater to the economizer.

The 15,000 lb/hr evaporator vapor and coil drain are normally delivered to the 30th stage heater, but provision has been made to bypass them to the deaerating section of the condenser when this heater is out of service.

Emergency make-up water is supplied from a 45,000-gallon cold condensate storage tank which serves both units 1 and 2. Water is

PRINCIPAL EQUIPMENT: Goldsboro Steam Electric Plant—(No. 1 Unit)—

GENERAL

This description applies to the No. 1 Unit (second unit installed) in the Goldsboro Station, 5 miles west of Goldsboro, N. C. Generating capacity of the unit is 62,500 kw, and boiler capacity is 550,000 pounds per hour at 1,450 pounds throttle pressure and 1000 F. Cooling water is from the Neuse River. Design and construction was by Ebasco Services, Inc.

GENERATING UNIT

Turbine-Generator ..... One—Westinghouse, outdoor, reheat, tandem compound, two cylinder turbine is direct connected to a 75,000 kw, 3600 rpm, 13,800 v, hydrogen cooled generator. Main and pilot exciters are direct connected.
Generator Coolers ..... Two—Westinghouse, fin tube, 6840 sq ft, 420 gpm cooling water.
Turbine Oil Coolers ..... Two—Westinghouse, parallel, 310 gpm oil, 620 gpm water.
Oil Filters ..... One—Bowser, 330 gal cap., 540 gph.
Generator Leads Equipment Delta Star Equipment Co.

CONDENSING EQUIPMENT

Condenser ..... One—Lummus, two pass, deaerating, divided water box, 392,000,000 Btu per duty, 50,000 sq ft.
Circulating Pumps ..... Two—Ingersoll-Rand, 36" vertical, mixed flow, 23,750 gpm. Driven by 350 hp, 695 rpm, 4000 v, Allis-Chalmers motor.
Condensate Pumps ..... Two—Worthington, horizontal, 550,000 lb/hr at 123.4F and 500 ft TDH. Driven by 200 hp, 1200 rpm, 440 v, Allis-Chalmers motor.
Condensate Transfer Pump One—Worthington.
Vacuum Gage ..... Precision.
Air Ejector ..... One—Lummus, two stage steam jet.
Priming Ejector ..... One—Lummus, hogging ejector; operates on 325 psig saturated steam, 90 cfm free air.
Expansion Joints ..... Goodall Rubber Co.
Traveling Water Screens ..... Link Belt Co.
Screen Wash Pumps ..... Turbine Equipment Co.
Cooling Tower ..... Foster Wheeler Corporation, three cell axial flow type; induced draft; capacity 1800 gpm/cell, from 99 F to 89 F, wet bulb 79 F.

BOILERS AND EQUIPMENT

Boiler ..... One—Combustion Engineering - Superheater, Inc., outdoor radiant reheat, single drum, pulverized coal fired, 550,000 lb/hr, 1670 lb per sq in. Steam drum 72" x 35' —0½". 3" blanket insulation and 22 gage steel lagging.
Superheaters ..... Elesco—One primary, one secondary; 35,000 sq ft, 1005 F tt.
Reheater ..... 8200 sq ft, 1005 F.
Furnaces ..... One—Combustion radiant pulverized coal fired, 25,430 sq ft heating surface.
Air Heaters ..... Two—Ljungstrom, vertical, center drive, 74,700 sq ft each heating surface, 649,000 lb/hr air, inlet temp. 80 F, outlet 601 F.
Soot Blowers ..... Diamond Power Specialty Co., automatic sequential—18 plus 2 on air heaters.
Blow-off Valves ..... Two—Edward Valves, continuous 1½".
Water Columns ..... Two—Diamond bi-color gages, illuminators, hoods, and mirrors.
Safety Valves ..... Maxiflow—Manning, Maxwell & Moore, Inc.
Boiler Blow-off Tanks ..... One—Project Fabrication Corp., vertical, 72" x 6' —6".
Ash Hopper ..... Allen-Sherman-Hoff Co.
Boiler Performance Indicators. Panalarm Products Co.

FUEL HANDLING, BURNING AND PREPARATION

Automatic Scales ..... Three—Richardson Scale Co., 40,000 lb/hr each.
Crushers ..... One—Hewitt-Robbins, Inc, 450 tons/hr, 250 hp, 720 rpm, 4000 v motor.
Belt Conveyors ..... Hewitt-Robins, Inc.
Pulverizing Mills ..... Three — Combustion Engineering — Superheater, Inc., Raymond Bowl Mills, Size No. 573, driven by motor-belt.

automatically transferred as required between this tank and the feedwater system. Provision has been made to raise the temperature of the water transferred from cold storage to the deaerating section of the condenser to 130 F by an automatic temperature controlled heat exchanger supplied with steam from a reducing station.

Since no separate deaerator is provided to supply a static suction head for the boiler feed pumps, these pumps are electrically interlocked with the condensate pumps. The boiler feed pumps cannot be started without adequate suction pressure. Failure of either condensate pump will sound alarm, automatically trip the running boiler feed pump, start the second condensate pump, and after pressure has been re-established start the other boiler feed pump. Stopping of a boiler feed pump due to low suction pressure will sound an alarm and automatically start the second boiler feed pump when the suction pressure is sufficient. Both the boiler feed and the condensate pumps are manually operated from the central control room.

Service Water System

Service water is taken from the discharge of the condenser circulating water pumps and pumped to two Spaulding type precipitators equipped with an after clear well. Here the water is treated with ferric sulfate, soda ash, and chlorine before being pumped into the service water system. A 50,000-gallon, 100 ft high elevated storage tank is arranged to float on the service water system.

Cooling water for the generator hydrogen coolers, turbine lube oil coolers, and miscellaneous bearing coolers is circulated in a closed system through a Foster Wheeler, three-cell, induced draft cooling tower. This cooling tower, serving both units 1 and 2, has a cooling capacity per cell of 1,800 gpm of

(*Continued on page* 151)

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So much interest has been expressed in SP&I's "Better Government" series (see No. 3 starting on page 84), that we are offering reprints in limited numbers free to our readers in the South and Southwest. Reprints of the following are now available.

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806 Peachtree St., N.E., Atlanta 5, Ga.

—Carolina Power & Light Company

Feeders	Three — Combustion Engineering — Superheater, Inc., Raymond, clutch driven.
Burners	Twelve—Combustion Engineering—Superheater, Inc., tangential, 9000 lb/hr each.
Coal Valves	Stock Equipment Co.
Ash Conveyors	United Conveyor Corp., Hydrojet.
Combustion Control	Hagan—Pneumatic.

DRAFT EQUIPMENT

Stacks	Concrete, 200 ft high.
Smoke Breeching	Custodis Construction Co.
Forced Draft Fans	Two—Green Fuel, 104,000 cfm, 10.2 WG each, direct motor.
Induced Draft Fans	Two—Green Fuel, 142,000 cfm, 15.9 WG each, direct motor.
Air Ducts	Combustion Engineering — Superheater, Inc.
Draft Gages	Bailey.
Draft Controls	Hagan.

BOILER FEEDWATER EQUIPMENT

Boiler Feed Pumps	Two—Worthington Corp., 8 WCS, 8 x 8, 6 stage radially split barrel casing; capacity 625,000 lb/hr at 312 F; head 4565 ft discharge; 3,560 rpm; driven by direct 1,750 hr, 4,000 v, Allis-Chalmers motor.
Bleeder Heaters	Three low pressure—Lummus Co. Two high pressure—Alco.
Deaerating Heaters	None—Deaerating section built into Lummus condenser.
Feedwater Regulators	One—Bailey, air operated piston actuated regulating valve.
Heater Feed Pumps	Two—Ingersoll-Rand, low pressure. Two—Byron Jackson, intermediate pressure.
Feedwater Regulator Bypass Valve	Copes-Vulcan Division, Continental Foundry & Machine Company.
Evaporator	One—American Locomotive Co., 15,000 lb/hr, integral deaerating preheater.
Evaporator Feed Pump	Gardner-Denver.

PIPING AND VALVES

Station Piping	The Grinnell Co.
Insulation and Antifreeze	Mundet Cork Corp.
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Stainless Steel Expansion Joints	Badger Mfg. Co.
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Pressure Transmitters and Gages	Manning, Maxwell & Moore.
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Butterfly Valves	R-S Products Co.
Solenoid Valves	Automatic Switch Co.
Valves	American Chain & Cable Co., Edward Valves, Inc., and Crane Co.

INSTRUMENTS AND CONTROLS

Main Switchboard & Control Panel	General Electric Co.
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480 v Turbine Room Control Center	General Electric.
Transmission Line Control Board	General Electric.
Power and Control Conduit	Gaffrey-Kreese Electric Supply Corp.
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Miscellaneous Instruments and Gages	Bailey Meter Company.
Float Switches	Magnetrol, Inc.
Temperature Transmitters	Moore Products Co.

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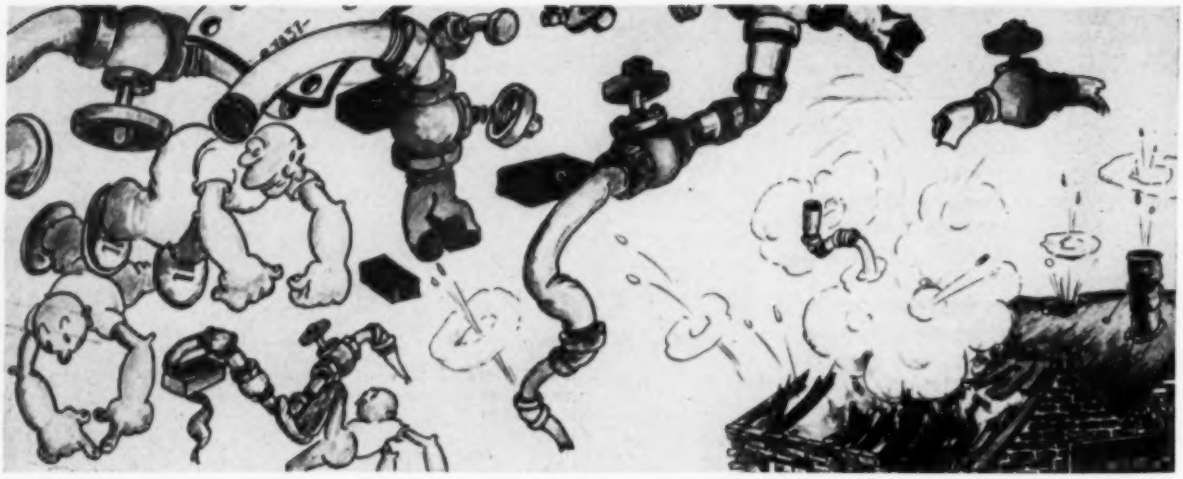
Auxiliary Motors	Allis-Chalmers.
Main & Auxiliary Power Transformers	General Electric.
Oil Circuit Breakers	General Electric.
Switches	Railway Ind. Eng. Co.
Instrument Transformers	Westinghouse.
Current Transformers & Relays	Westinghouse.
Lighting Load Center	Penn Electrical Co.

MISCELLANEOUS

Sump Pumps	Turbine Equipment Co.
Gland Seal Tank	Richmond Engineering Co.
Loud Speaker System	Gai-Tronics Corp.
Fans and Ventilators	John B. Hewitt Co.
Structural Steel	Fort Pitt Bridge Works.



"Maybe we should'a told that guy it was for high pressure service." Illustrations by Bill Eddy

Keep Them GUESSING

By E. A. MURPHY, Industrial Division, Minneapolis-Honeywell Regulator Co.

Be the strong silent type—when you purchase plant equipment, make your supplier guess what you need. You can sometimes get a lot more for your money that way.

WHEN YOU purchase equipment, do you feel as though you will be disclosing top secret information if you give the supplier a clue as to what the equipment is going to be used for and under what conditions it will have to operate? If you do, you're probably paying dearly for the privilege.

And it doesn't matter whether you're purchasing pumps or pilot plants, cupolas or control instruments—the results obtained will generally follow the same pattern. You will probably wind up with equipment that: (1) you can't use; (2) you can use, but isn't just what you had in mind; (3) will not operate satisfactorily no matter what you and the supplier do to it; or (4) not only will not operate properly, but also blows its top and damages other equipment that had been working fine up to then.

The Pump That Let Go

Take the case of Joe Pink. He was the strong silent type, too; so much so that he'd prefer we didn't use his or his company's name in this anecdote. Joe held a pretty responsible job in a big organization and was a top-notch engineer He was good enough to be able to perfect a new and better way of operating one of their processes. The new method required the use of a pump so Joe told the purchasing department to get him a pump of a certain size and capacity. The purchasing agent asked him what he wanted it for, but Joe is the type who doesn't trust anybody so he told him it wasn't any of his business. Just get him one of the size and capacity specified, said Joe.

In due time, the pump arrived and was installed. It was a good pump—sturdy, well designed, and well made, but it didn't know what it was in for. For the first couple of days the process worked beautifully, and Joe was basking under copious back slappings from the big bosses. His idea was saving the firm big money.

Then on the fourth day it happened. The pump let go and spewed steaming hot acid all over the neighborhood. Luckily no one was killed, but a couple of men ended up in the hospital, and the whole process was down for some time until a stainless steel pump could be obtained and installed.

Whose fault was it? The pump manufacturer's? The original order made no mention of hot acid as the fluid that was to be handled. The purchasing agent's? He had never before had occasion to buy a pump to handle hot acid, and Joe wouldn't tell him what he wanted the pump for. The whole blame for the thing rested squarely on Joe's shoulders,

and the big bosses hastily retrieved the back slaps that they had so freely passed out a few days before.

The Valve Wouldn't Let Go

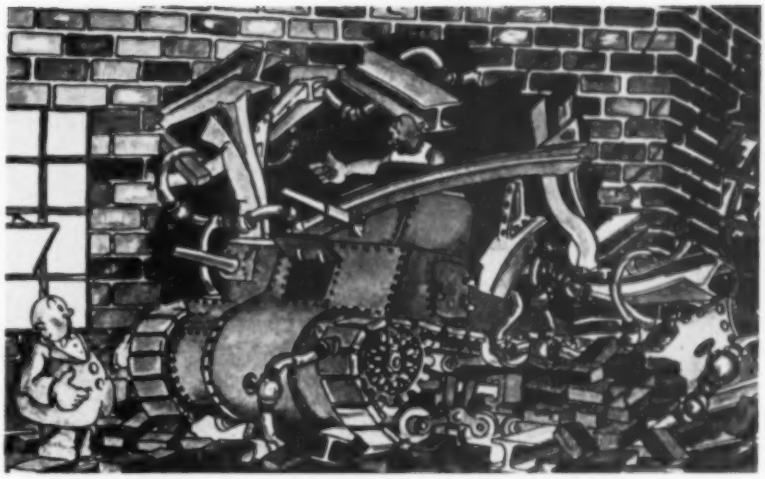
And then there was Otto Zilch. He was doing development work for a big chemical outfit and, he, like Joe, had developed a dandy new process. It worked out fine in the pilot plant and Otto was put in charge of setting up a production job. The process required diaphragm motor valves—quite a few of them—so Otto ordered the valves. He figured that one particular type of valve would be satisfactory so he ordered a whole batch of that type.

Now although Otto was a high class process engineer, he was no great shakes as a valve man, and that caused his downfall. For it so happened that one of these valves was controlling a fluid that was well below the freezing point of water. And it also happened that the successful operation of the entire process depended upon extremely close control of this frigid fluid.

Those of you who have been concerned with the use of valves in controlling sub-zero fluids can already see what's coming. Unfortunately for Otto, he didn't see what was coming until it had come. After a few hours' operation, the entire process went out of control and had to be shut down.

At first it was thought that an instrument—the one that controlled the valve in the frigid fluid line—was at fault, and many hours were spent in checking it. When the instrument was found to be in perfect condition, the process was again started up, and again ran perfectly for several hours, after which it went into a second convulsion. This sort of unnerving thing went on for a couple of days until an instrument mechanic stumbled on the source of the trouble. After the process operated a few hours, ice would coat the stem of the valve in the frigid fluid line and it wouldn't work.

If Otto had told the valve manufacturer in the first place, how he wanted to use that valve, he would have received a valve with an extension column. He finally got one and the process ran like it was designed to run. But, when you added up all the man-hours spent in finding the trouble, plus lost production because of process downtime, it was a mighty expensive valve. Otto is not so much the strong, silent type any more.



"The order didn't say nuthin' about a MIXING tank!"

The Silent Instrument Buyer

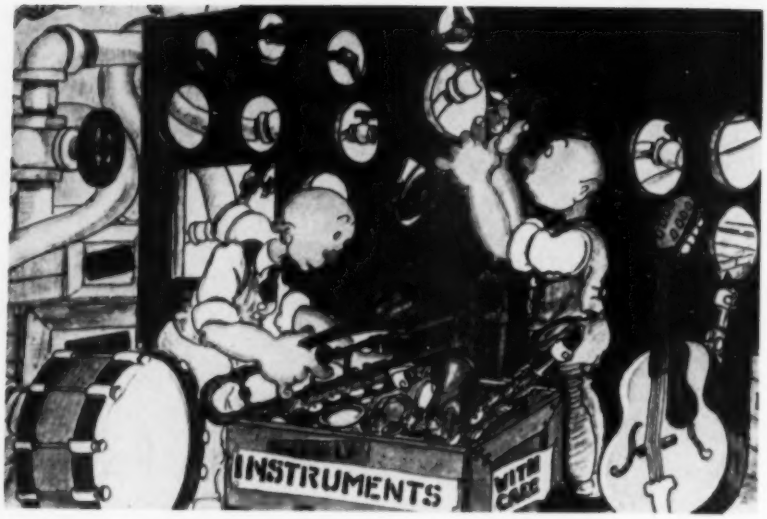
In the purchase of industrial instruments, possibly more than in connection with any other type of equipment, the strong, silent type can work himself into some horrible situations. Not only that, but in doing it he manages to materially increase the ulcer crop in the sales and engineering departments of the instrument manufacturer. Why this should be so we cannot say. Possibly the instrument manufacturers themselves have unwittingly contributed to this situation by banging the drums vigorously about the amazing flexibility of modern instrumentation. Whatever the cause, it would save countless hours of production time, thousands of dollars, and numberless frayed nerves and tempers, if this "pig in a poke method" of purchasing could be stamped out.

There was the plant engineer who ordered a recording pressure gauge calibrated 0 to 150 psi. He hadn't had it installed for more than a week before he was shouting for a service man. The service man found the measuring spiral straightened out like a KO'ed heavyweight contender. Some intensive sleuthing by the service man brought to light the fact that the line in which the instrument was measuring the pressure was subjected intermittently to pressures of several thousand psi.

Why hadn't the customer told the instrument maker about that when he ordered the instrument? "Because," as he put it, "I wasn't interested in measuring those intermittent high pressure surges." And, of course, he didn't stop to think that a 0 to 150 psi instrument was not only not interested in measuring them, but went to pieces at the very thought of it.

Another individual, this time a plant superintendent, ordered several flow meters. Necessary flow calculations were made, orifice plates were fabricated, and the flow meters were installed. Again, after a few days operation, screams of anguish from the customer. This time the situation was further aggravated by the fact that the instruments were controllers tied into a pretty important process. The way those instruments were controlling, the process was doing things it had never been designed to do, and the plant superintendent was most unhappy about it.

Again the poor service man got to work, checking calibration, checking control settings, checking everything he could lay his eyes or hands on. And the further he checked, the more perplexing things got, for everything checked out right on the nose. As a last resort it was decided to investigate the original flow conditions upon which the meter calculations had been



"I told the Old Man that Purchasing Agent didn't know from nuthin' about ordering instruments"

based. Guess what! They had been drastically changed between the time the flow meters were ordered and had been installed. Naturally the flow calculations had to be done over again; new orifice plates had to be made and installed, and the meters had to be recalibrated. Dollars and man-hours all down the drain!

Another case involved an order for twenty-four controlling thermometers with copper bulbs. What the customer didn't state when he placed the order was that the bulbs were to be immersed in a fluid that acted on copper about the same way water acts on sugar. There's no need to describe what happened.

Why didn't he inform the instrument manufacturer of these conditions at the time he placed the order? Your guess is as good as ours. Maybe he didn't know how unfriendly that particular fluid was toward copper. But—if he had mentioned the nature of the fluid, the instrument manufacturer would have known, and would never have shipped out instruments with copper bulbs.

Control Instruments

Sometimes, the information supplied to an equipment manufacturer is accurate and reliable as far as it goes, but it doesn't go far enough to keep the purchaser out of trouble.

At a certain paper mill in a location we shall carefully fail to mention, there was a man who decided to equip his two dryer sections with automatic temperature control. Now the average paper dryer gulps down one whale of a lot of steam, and these two were no exceptions, each one being supplied by steam controlled through a 12 in. valve. The temperature control instruments were correctly specified and installed, and for a few days seemed to be doing an excellent job.

And then it was decided to run a heavier board on the two machines—both of which received their steam supply from an extraction turbine that provided electric power for the mill. When this heavy board hit the two dryer sections it started to come out underdried. The machine tenders knew that more heat was needed, so they shoved the control indices of both temperature control instruments to the tops of the scales. What happened? The two temperature controllers tried to do their part by slamming two 12 in. steam valves wide open. This sudden demand on the power plant shut the turbine down thus depriving the mill of electric power, and almost sucked the water out of the boilers.

For a little while there were a lot of people running around in tight circles trying to figure out what had happened so they'd have some kind of a story to tell the mill manager who was getting rather profanely curious.

The instrument foreman finally arrived at the cause of the trouble, and the two dryers went back on manual control until something could be done about guaranteeing against the mill having another complete nervous breakdown. The solution? Not too difficult.

Each dryer section was equipped with a steam flow controller whose control index was set at the maximum allowable steam "take" as dictated by the plant engineer. The instrument cases were locked and the keys buried in the plant engineer's bottom desk drawer. These instruments were interlocked with the temperature control instruments so that they (the flow controllers) would take over control

(*Continued on page* 149)

You're paying for know-how—Make use of it

If you will bear in mind two things you will find that you can get a far greater return for your dollar, and enjoy considerably more peace of mind in your dealings with equipment manufacturers in general and instrument manufacturers in particular. Just remember that the fellow from whom you are purchasing the equipment is an expert in his own field. He may not know beans about your particular business, but he's right at home in his own. Remember, also, that while you are an expert in your field, you may only know part of the story when it comes to equipment you are buying.

Take advantage of these facts. Make use of the tremendous store of know-how at your disposal. Put your problems up to the supplier. Give him all the information he needs. Tell him if any unusual conditions exist. And then sit back and let him recommend the correct solution to your problem. If he can't solve it he'll be honest with you, and save useless wear and tear on your nerves as well as your pocketbook. The firm with whom you are dealing has devoted years to accumulating a vast store of experience, and you are going to pay for it. You might as well use it!

Giving your belting proper attention?

Maintenance of Rubber CONVEYOR BELTING

Adapted from data furnished by
FRED MATHEIS of the Thermoid Company

Portable vulcanizer for shop use. Top half bolted to bottom with belt between. Old belt in front serves merely to support part of vulcanizer not in contact with repaired spot.

SUGGESTIONS FOR PROLONGING BELT LIFE

One of the basic requirements for long belt life is that the material must fall on the belt while moving in the same direction and at the same speed as the belt.

Material should be directed on the center of the belt, not toward one side. Material falling on the left side will make the belt ride out toward the right and vice versa. As a result, belt will not train properly and will rub against guard boards and training idlers, increasing edge wear.

When lumpy material is being carried, an attempt should be made to have such material cushioned by a prelaid layer of fine material. A screen or "grizzly" at the bottom of the leading chute will satisfactorily deposit a layer of fines over the belting, thus providing protection against bruising. In some instances an oval or "fish tail" notch cut in the lip of the chute will aid in prelaying the fines.

At the same time, the velocity of loading material flow should be controlled by pitching the loading chute properly. If this is not feasible, a baffle of iron or wooden bars should be constructed in the chute, suspended from the top and free-swinging at the bottom, to reduce the velocity of material flow onto the belt.

In like manner, the vertical distance between chute and belting should be small to prevent excessive velocity of material which in the case of lumpy material, might be great enough to cause belt damage.

BELT maintenance begins even before the belt is installed When received by truck or railroad from the manufacturer, it should never be dropped off but should be skidded, rolled or lifted. A large roll of belt will weigh several tons A short computation will prove that several tons falling from a freight car will develop a surprising impact over the area of contact, enough to weaken the belt. If the belt roll falls on a stone, tool or track, a cut or puncture may result. If the belt is not installed at once, it should be stored, protected from sunlight, where it is not likely to be damaged accidentally.

Installation threading of the belt over the idlers and pulleys is critical and much belt damage may occur during installation. More than ordinary care and planning are needed. Avoid sharp bends. Minimize dragging over sharp rough surfaces. Don't twist sharply. Before belt is run, check for tools left accidentally on the return side. Don't use excessive tension in pulling the belt over the idlers and pulleys.

Maintenance Organization

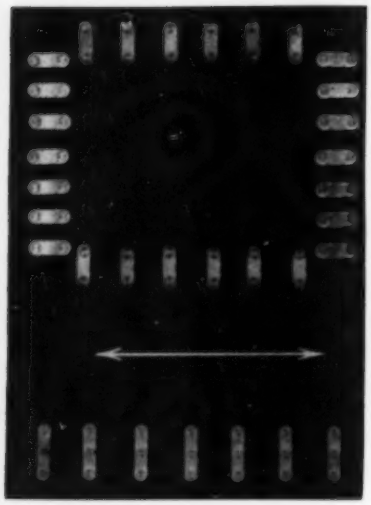
Authority and responsibility for belt maintenance should be delegated to one man who with his assistants, checks lubrication, condition of idlers and pulleys, examines the belt for excessive wear, inspects splices at frequent intervals, repairs cuts and tears as soon as discovered, maintains a kit of belt repair tools. The belt maintenance boss should also check the belt for oil and grease which should be removed. Avoid over-lubrication of pulleys and idlers. In large companies using many thousands of feet of belting, a rather elaborate organization may be justified including a belt repair shop with both portable and permanent vulcanizing equipment, belt tables, drying racks.

Even in the best regulated plants, some material falls off the carrying surface of the belt onto the bottom cover or return side of the belt. If not removed, severe damage to the belt will occur when the belt travels around the pulley and the misplaced pieces are squeezed between belt and pulley. Brushes and scrapers are often used but the best solution to the problem is to completely cover the return side of the belt with a wooden or metal deck.

When a permanent installation is made out-of-doors, it will probably pay to cover the belt with a wooden or steel structure. This will keep off direct sunlight which speeds up oxidation, another enemy of rubber belt. One company has covered a wide belt with a long, continuous Quonset hut which is heated in winter.

Belt Repairs

In order to get the maximum ser-



Rip plates have been used to repair the longitudinal tear at the top of the illustration. Standard fasteners are used on transverse rips.

Illustrations used in this discussion were furnished by the *Thermoid Company* of Trenton, N. J. — manufacturers of conveyor and elevator belting, transmission belting, V-belts, wrapped and molded hose, rubber sheet packings, industrial brake linings and friction materials.

vice life out of conveyor belting, users should take particular care to repair all belt damage as soon as it is discovered.

Belt fabric exposed to weather will absorb moisture if the protective cover becomes damaged, and may even become soaked. In warm weather, this condition leads to mildew and rot; in winter, ice crystals may gnaw at the fabric from within as the belt flexes. Thus, immediate repairs not only prevent the spread of damage, with its threat of premature failure, but also keep out the water which is the natural enemy of the conveyor belt carcass.

Equipment

Simple tools and procedures will help the maintenance man to give belting proper attention. An adequate repair kit includes sharp cobbler's knives and a stone to keep them sharp; a supply of emery cloth, rubber cement, inner tube patching rubber, rip plates and standard belt fasteners and accessories, together with rags and gasoline for cleaning. As each belt is installed, remnants should be saved, because they will prove useful in subsequent repairs.

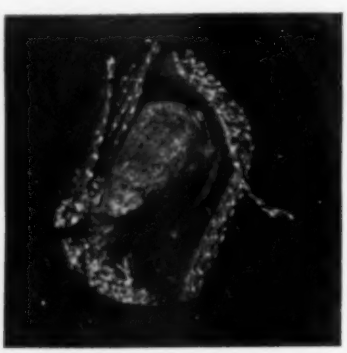
Methods

To mend long and deep cuts which go through to the fabric, open the cut, clean out all dirt, and cement the cut closed, allowing the cement to dry thoroughly before the belt is restored to service. Where bits of torn cover leave exposed spots with only slight damage to the fabric, remove the loose ears of cover stock by carefully cutting a curved and bevel-edged area around the spot; then sand the edges, apply the patch flush with the belt cover.

Where gouges have penetrated

(*Continued on page* 113)

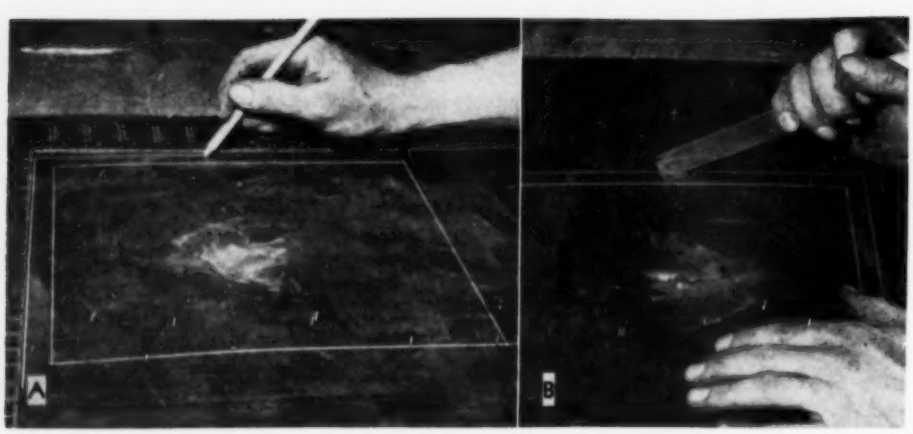
THE TOOLS—Typical repair kit showing emery cloth, sharpening stone, cobbler's knives, rubber cement, sheet of patching rubber, cotton duck impregnated with rubber, belt fasteners, waste for cleaning, fabric pulling pliers, and roller.



THE PUNCTURE — Belt maintenance crew discovers serious puncture made by a rock.

Rock is withdrawn and entire section of belt is taken to belt repair shop.

THE METHOD — Section of belt to be removed is carefully marked out on the top cover with a square (A). Section should be large enough so that the final square after cutting out squares of decreasing size through several plies, will completely encompass damaged area.



A thin strip about ½ in. wide is marked out inside the large square (B) cut through cover to first layer of fabric with a sharp cobbler's knife.

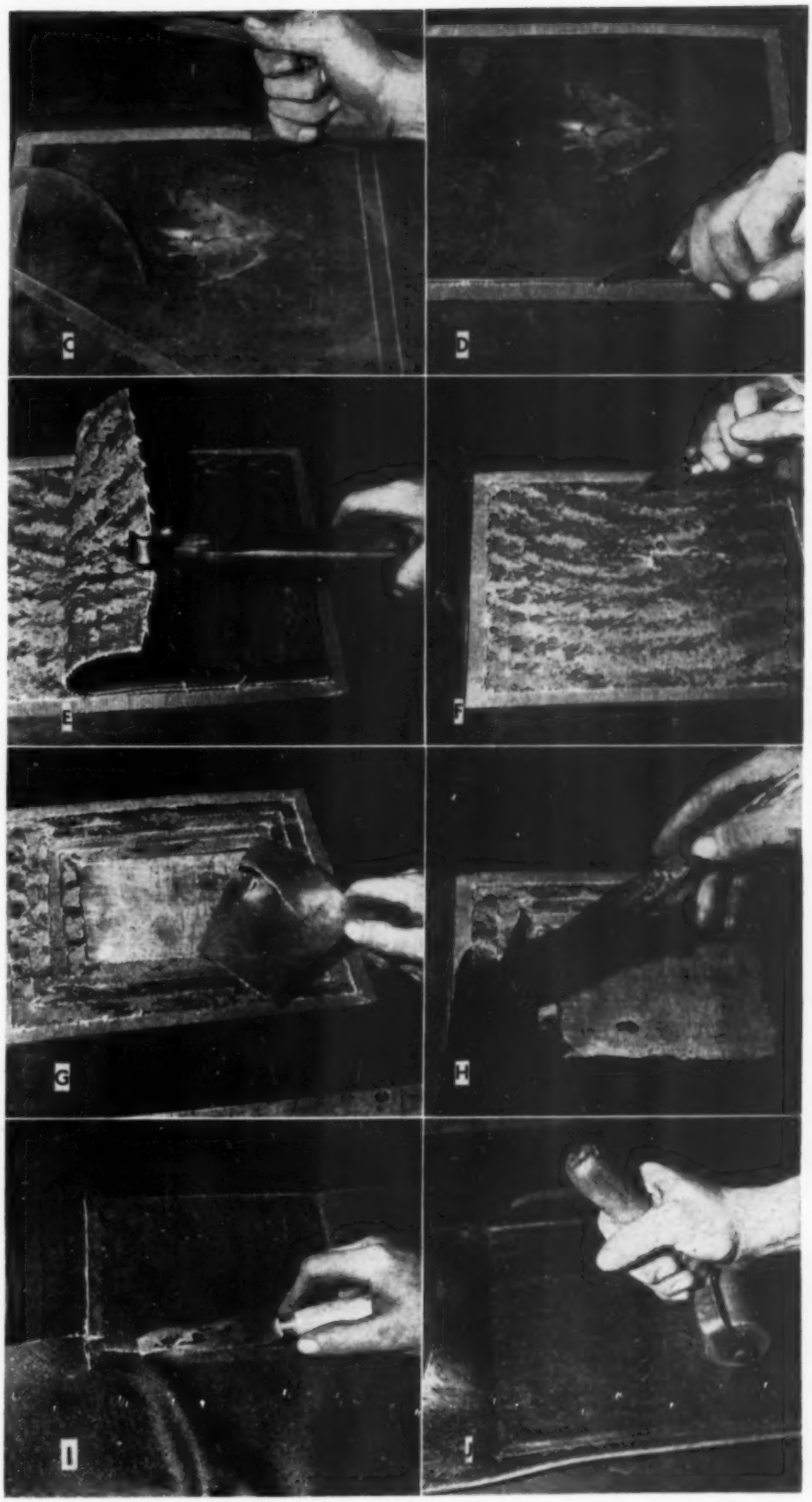
The thin strip is pulled off (C). Using the edge of the square of cover inside the strip as a guide (D) cut through the first layer or ply of fabric.

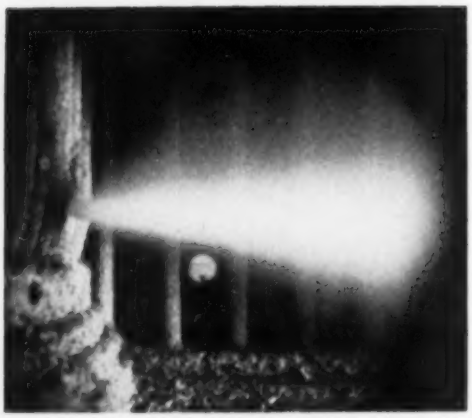
Belt pulling pliers (E) are used to pull off the first ply with adhering cover. Remove progressively smaller blocks of fabric with each successive ply (F). Square to be cut should be marked out indenting about ½ in. before cutting, being careful to keep incisions parallel to and at right angles to the edges.

Finally the bottom cover is removed (G). Note that the damaged area has been completely removed. Note also that all lengthwise cuts have been made parallel to edges. Belt is then turned over and the bottom cover is pulled off in a strip about 2 in. wide. Be sure that the belt fabric exposed is completely dry. Then clean and roughen the cavity. Apply rubber cement thoroughly (H).

After cement has been applied, squares of rubber impregnated fabric are cut to fit each layer until cavity has been filled (I). A piece of uncured rubber of the same thickness and composition as the original cover is cemented in (J) and rolled flush. Then the overlapping edges are trimmed flush with the original cover.

After the vulcanizing process, the patched belt is ready for service.

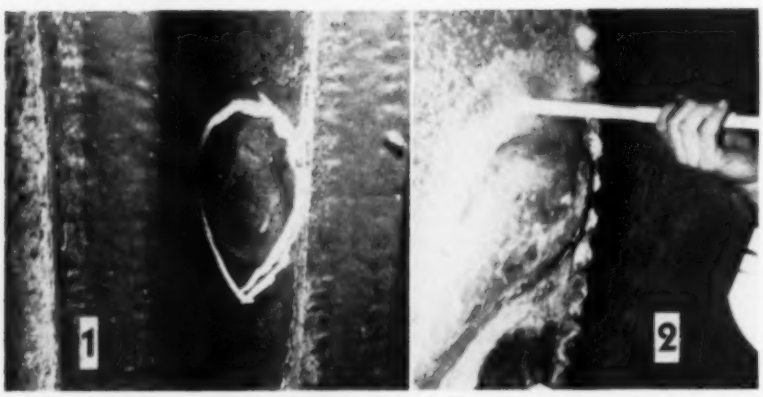




SCALE . . . Formation a

TROUBLES?—Internal deposits . . . overheating

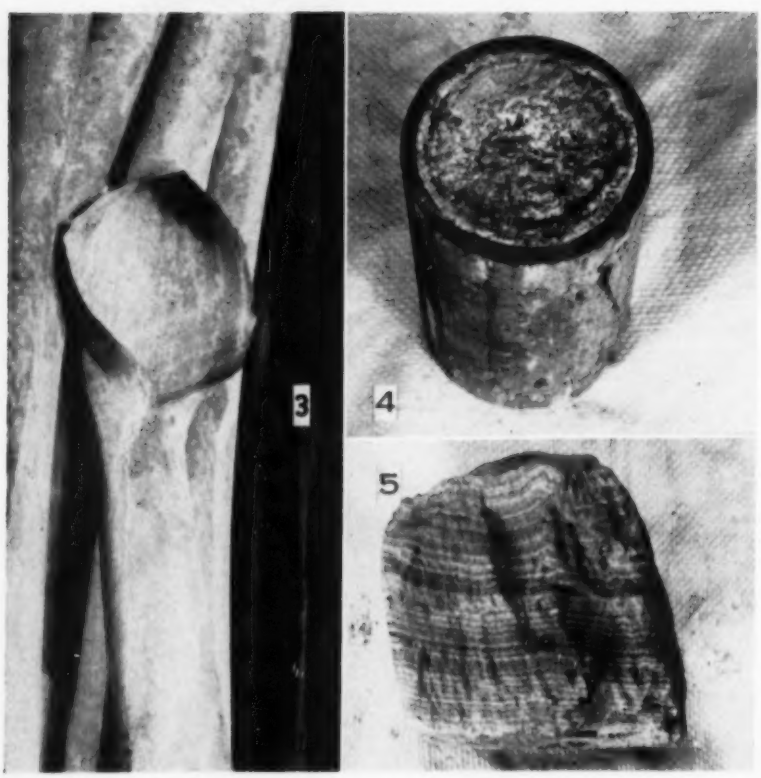
Here's a dreaded sight for the power plant operator. Overheating, as a result of internal deposits in a boiler tube, can cause bulging. If the deposits are not subsequently removed, failure by rupture will almost certainly happen. This view, photographed through the "peephole" in a furnace of a large watertube boiler shows steam blowing from a ruptured waterwall tube.



(1)—bulge on the fire side of a waterwall tube in the furnace of a large watertube boiler. After removal, the tube was examined and found coated with a fairly thin film of scale.

Because of the high steam generating "load" placed on waterwall tubes, it is extremely important to prevent the formation of even a thin coating of scale. Closer control over the administration of chemical treatment would have prevented this.

(2)—results of scale. Bulging of the lower shell plate near the blowoff connection in an H.R.T. boiler.



(3)—a ruptured generating tube in a large watertube boiler which overheated because of scale.

(4)—this 3 in. tube was located in the rear bank of water downcomers in a large watertube boiler. It had become completely plugged with scale.

(5)—an extreme condition of scale. Believe it or not, this chunk of scale was removed from the mud drum of a watertube boiler after years of operation without feedwater treatment or cleaning. It is about 3½ in. thick, and gradually built up in successive layers or "strata" form.

By JAMES G. SYLVESTER

The author is a member of the consulting engineering firm of **Harry M. Spring, Jr., and James G. Sylvester,** of Canton, Mass. The February '52 issue of SP&I carried another excellent article by these engineers—**Boiler Tubes—What Can Happen and What to Do.** Illustrated discussion featured pitting and corrosion, external corrosion, erosion, bulges, burning, ductile rupture, bowed tubes, quenched cracks, brittle rupture, laminations, and embrittlement cracks.

and Removal *SIMPLIFIED*

REMEDY?—Proper chemical feedwater treatment

SCALE is the natural enemy of boiler plant operators. With it comes trouble — overheating of boiler parts, loss of efficiency, and long hours of drudgery, chipping and cleaning it out. But most important of all is the price a plant must pay for putting up with it. Expensive repairs, increased fuel consumption, and extended down time periods add up to costly operation. The engineer who is "on the ball" is the engineer who keeps his boilers clean.

Overheating as a result of internal deposits in a boiler part can cause bulging (note illustrations 1 and 2 on the opposite page). If the deposits are not subsequently removed, failure by rupture (illustration 3) will almost certainly happen. Note the section of tube shown in illustration 4. It was taken from the rear bank of water downcomers in a large watertube boiler. As the tube was located in a relatively cool pass, there was no overheating, but consider the restricted circulation and loss in boiler efficiency that resulted.

This latter condition went unnoticed for several weeks because the plugged section was beyond a bend in the tube and couldn't be seen during inspection. It was finally noticed when an operator had difficulty pushing a tube turbine through it.

Chemical Treatment

The natural enemy of boiler scale and all its attending difficulties is properly administered chemical feedwater treatment. Here again, the engineer who is "on the ball" believes in chemical treatment and makes it his business to understand it. He realizes first of all, that there is no such "animal" as a naturally "pure" raw water. Almost without exception, all raw waters for use in boilers operating at pressures above 15 psi contain dissolved impurities which, if not removed, multiply after evaporation in the boiler and then precipitate out on heating surfaces as scale.

Let's discuss feedwater treatment from a practical point of view. It could become a complex subject if we were to cover it completely, but for our purposes let's just consider calcium and magnesium, the two bad actors as far as scale is concerned. Silica type scale is also a big offender, but does not occur so readily as the calcium and magnesium types. Calcium and magnesium are present in larger or smaller amounts in practically all raw water sources. Their combined total amount is expressed as the "total hardness" in a feedwater analysis.

Since calcium and magnesium are primarily responsible for most scale deposits, it follows that we can compare "total hardness" with the amount of scale to be expected. The higher the hardness, the more scale to be expected. The lower the hardness, the better is the water for evaporation in a boiler from the standpoint of scale.

Classification of Raw Water Sources

Total Hardness	Classification
0 — 15 ppm	Very Soft
15 — 50 ppm	Soft
50 — 100 ppm	Medium Hard
100 — 200 ppm	Hard
200 — ppm	Very Hard

Total Hardness—Calcium & Magnesium

Calcium and magnesium compounds in cool raw water are totally dissolved, and as such, cause no trouble. But they have the chemical property of becoming insoluble when the water is heated—they will precipitate out of the water and form a solid when the water is heated. At higher temperatures, more solid calcium and magnesium will "come out" of the water than at lower temperatures. In other words, the higher the temperature of the water, the more calcium and magnesium solids to be expected.

When water is heated in a boiler, this is exactly what happens. Calcium and magnesium solids "come out" of the heated water in a boiler as a "sticky" deposit. We say "sticky" here because it adheres to boiler heating surfaces as a hard heat insulating scale. It should be noted here that calcium and magnesium do not form this scale by "themselves." The actual mechanism involves other materials which are also present to combine with calcium and magnesium. But calcium and magnesium are the primary products in the deposited scale and if they are removed before such deposits can form then these reactions cannot take place, and very little scale will form.

Proper Treatment

Calcium and magnesium may be removed by *external* or *internal* treatment. It is practically impossible to effect complete removal with external treatment—a boiler must be treated internally as well.

Practically all modern internal feedwater treatment processes use a phosphate chemical to remove calcium. Phosphate is never found naturally in a raw water. By introducing the "stranger," phosphate, you form by combination with calcium the *least* soluble of all calcium solids. Under the proper conditions, the phosphate chemical will preferentially combine with any calcium present in the boiler to form calcium phosphate. This is called a sludge, and it is *not* "sticky." As such it will fall to the lower regions of the boiler and may be removed by blowing down.

Further insurance against the calcium phosphate "sticking" to boiler surfaces is sometimes provided by also adding an organic material (such as tannin). This serves to condition the sludge and render it even more slippery.

A phosphate test (when making a water analysis) is therefore made to make certain that an *excess* amount of phosphate is always present. An "excess" is desirable since it causes a continuous "push" action against the calcium at all times.

The importance of control tests is evident when one considers the

(Continued on page 142)

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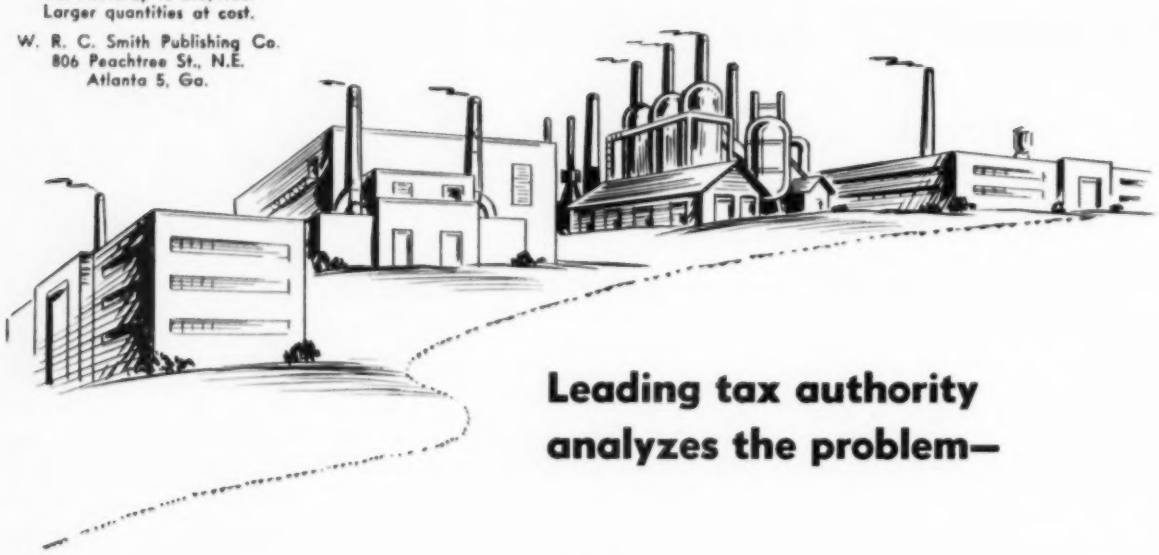


Leading tax authority analyzes the problem—

Opportunities for

"New industry in the South is increasing at a rate 50% higher than that of the nation as a whole. But these brilliant gains can be wiped out unless there is a sharp reversal in the trend of Federal taxes."

By JOHN W. HANES

SOUTHERNERS can be proud that the recent industrial and economic growth of the South has outstripped the rest of the nation. For the first time since the War Between the States, the South has begun to assume its rightful place in the national economy. The brilliant gains of recent years, however, can be wiped out unless there is a sharp reversal in the trend of Federal taxes and tax policies.

High taxes are always painful to every sector of the economy but they are especially damaging to new and growing business. It is significant that new industry in the South is increasing at a rate 50 per cent higher than that of the nation as a whole. Hence, the South even more than the rest of the nation has a direct stake in Federal taxes and tax policies that hamper business growth and activity.

Moreover, restrictive tax policies have more than regional interest. Admittedly, the biggest problem to be faced by the new National Administration headed by President Eisenhower is the Korean war and the general international situation. But it is likewise true that our national security depends on the productive strength that has won us victory in two World Wars. In other words, we must maintain the strong national economy which is essential to long-term victory over Russia in both the hot and cold wars. Sound fiscal policy in the Federal government will go a long way toward keeping our economy strong enough to meet all aggressive threats.

Unfortunately, we do not at present have a sound Federal fiscal policy. Excessive expenditure is one Federal shortcoming, but I am concerned here primarily with taxes. Few people seem to realize that *the present total tax burden is greater than at the peak of World War II. In fiscal 1944, the Federal government collected $44 billion. In fiscal 1953, revenues will reach an estimated $69 billion.*

Individual and Corporation Outlook

Nor is the outlook less grim on an individual taxpayer basis. In just three years, between 1949 and 1952, the tax liability of low income taxpayers increased some 30 percent. It is no wonder that a $3,500-a-year man today pays almost a third of his income in direct and hidden taxes. And in the top income brackets, the tax collector takes as much as 92 cents of every extra dollar earned.

Similarly, corporations today find themselves paying up to 82 cents of every dollar of profit to the Federal government. Between 1949 and 1952, the tax liability of a small corporation with a net income of $25,000 jumped 30 percent, from $5,750 to $7,500—not including any possible excess profits tax. Similarly, a company with a net income of a million dollars had a 35 percent increase in tax liability, from $380,000 to $514,000—again not including EPT.

The so-called excess profits tax itself is perhaps the greatest single tax barrier to the kind of strong, ex-

In this article—No. 3 in a series of problems of business and government, written exclusively for the W. R. C. Smith publications—a recognized leading authority on Federal taxes and tax policies outlines the opportunities for tax reduction and more equitable distribution of the tax burden.

Tax Reduction

JOHN W. HANES, native of North Carolina, is one of the nation's most noted finance executives and tax experts. He is currently a chief executive of United States Lines Co., Olin Industries, Inc., Ecusta Paper Corpn., and director in many other corporations. He was Under Secretary of the Treasury during 1938-1940.

Chairman, Tax Foundation

panding economy we need to face up to international aggression. In this connection, it is important to remember that not only the U. S. but the whole free world depends largely on our productive strength.

Business has been operating under the Excess Profits Tax Act of 1950 for nearly two years. Actual experience has underlined the validity of the strong arguments made against the tax when it was proposed. The major argument against EPT, borne out by many case histories, is that by severely penalizing small or growing companies the tax inevitably retards the expansion of the economy. I have already pointed out the particular application of such repression in the growing industrial South. Let me give you one example, without identifying the company any more than by saying I can vouch for the accuracy of the example.

How the EPT Throttles Expansion

Here was a company that was planning as early as October 1948 to enter an entirely new manufacturing field. Its parent corporation was legally committed to enter the new field on November 4, 1949, while the legally-binding contract was assigned to the company on March 6, 1950. Because of the way the EPT law was written, any profits on the new operation would be taxed at a rate of 82 cents on every dollar. The supposed over-all tax limitation of 70 percent on any corporation would provide no relief whatsoever.

This places the Southern company in a position where it is virtually impossible for its new operation to survive, since its competitors were manufacturing the same product throughout the entire base period and therefore enjoy a normal excess profits credit. Since the inequities of the excess profits tax are not limited to this company alone, what is happening to all the other Southern corporations which have been responsible for the tremendous industrial growth of the South? It is plain, indeed, that taxes and tax policies of the Federal government threaten the economic progress of the South.

Here is another case to show how the excess profits tax throttles industrial improvement. An oil company made a study involving the installation in its refinery of two new processes which had been developed in its laboratories. The company found the total investment would be about $15 million. On a tax-free basis, the investment would pay for itself in about two years. The investment would have been a risk worth taking if the invested money could be returned in two years. Unfortunately, the oil company was operating in the excess profits bracket which meant that 82 cents of every dollar of profit from the new investment would be taken in taxes.

Instead of the proposed improvement paying for itself in two years it would require more than eleven years. This factor made the risk too great because of the possibility that a better process within three or four years would make the proposed improvement ob-

solete. Instead of paying for itself, the investment would very likely result in a substantial loss. At best, it wasn't worth taking the chance.

Thus the excess profits tax not only handicaps industrial expansion but also places a great barrier in the path of industrial research and development. As one research engineer put it, "a research and development organization must be a bunch of magicians to overcome so serious a handicap as imposed by our income tax laws."

The arguments against the EPT are endless. The tax strangles productive effort by effecting a tax-orientation of management. Removal of the profit motive as an incentive to cut production costs and avoid waste and extravagance results in managerial decisions not wholly based on sound business consideration. In other words, a company is inclined to be less careful about what it does with 18-cent dollars (after EPT) than it would if it could keep a larger slice of the profit dollar. At the same time, this factor contributes to inflation by exerting an upward pressure on prices, stimulating competitive bidding for scarce manpower and materials, and encouraging debt.

Finally, from a purely mechanical standpoint, experience demonstrates that EPT is difficult to administer and does not provide adequate relief in inequitable cases. Besides increasing the accounting burden, controversy, litigation and cost of compliance, EPT makes extensive research necessary in economics, business and related subjects in order to settle tax liability. The complexity of the EPT keeps tax-writing committees of Congress busy making changes in the basic law. The Revenue Act of 1951 alone made 23 technical and structural changes in the Excess Profits Tax Act without dimming the cries against EPT injustice.

The result of such patching and amending is not one broad excess profits tax law for the whole corporate economy, but a series of individual excess profits tax provisions for specific industries. Every month that passes brings to light more and more EPT inequities. The eventual outcome can only be a law that is nothing but a hodge-podge of special provisions.

Business Profits Declining

Few people seem to realize that for the second successive year, business profits after taxes declined in 1952. In other words, while employment is at a peak, while individual incomes increase, while virtually every segment of the economy is increasingly prosperous, business and industry show declining profits. Here are the figures:

ANNUAL RATE OF CORPORATE PROFITS
(Billions)

	Before Tax	After Tax
1950	39.6	21.2
1951	42.9	18.7
1952 (1st Half)	41.2	17.5

When we consider that national security itself depends on maintenance of our productive facilities, the decline of profits in our incentive economy becomes doubly dangerous.

Reductions in the Tax Load

Since this is true, and since it is likewise true that the individual taxpayer is intolerably hard-pressed, is there any possibility of tax reduction in the near future? I believe there is. An essential part of any tax reduction program, however, is a simultaneous effort to cut Federal expenditures, which are the long-run key to the tax problem. It seems fairly evident that the new Administration and the new Congress will labor this year to make sizable reductions in wasteful and unnecessary Federal spending.

On the assumption that expenditures will be reduced, I believe we can go ahead with a program to ease the unprecedented tax burden that is handicapping the full development of our productive capacities. It is my conviction that we should let the most recent tax increases die on their expiration dates something as follows:

The Excess Profits Tax Act should most certainly be allowed to expire when its current authorization ends on June 30, 1953. It is significant that many economists in and out of government see the possibility of a recession beginning about the same date. Nothing would give business a better boost than the end of EPT.

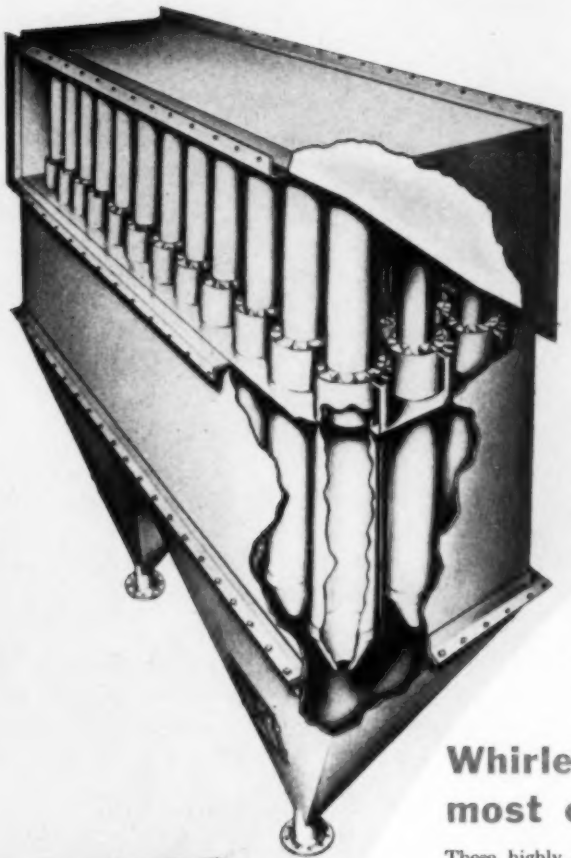
The most recent 10 or 11 percent increase in the individual income tax is due to expire on December 31, 1953. Since the individual needs as much tax relief as corporations, we might let the individual increase expire on schedule—or even better, move the expiration back to June 30 so that both the corporations and individuals receive relief at the same time.

Next recent tax scheduled to expire is the 5 percentage point increase in the corporate income tax, due to end April 1, 1954. That also should be allowed to die on schedule, along with the most recent increases in excises which are due to expire on the same date.

Expiration of these taxes would result in an estimated loss of about $2 billion in Federal revenues for fiscal 1954. For a full year the estimated loss of revenue might be about $8 billion. If the budget is to be balanced in fiscal 1954, these tax cutbacks mean that expenditures must be about $10 billion less than estimated for the present fiscal year (1953). Such a goal certainly is not too much to expect from an Administration and Congress elected at least partially because of its program of economy in government.

Moreover, in discussing estimated revenue losses from these tax reductions, we should remember recent tax history which indicates that revenue losses due to tax reductions frequently are not as bad as they are painted. The Revenue Act of 1945, which was expected to reduce individual income tax collections by $2 billion in fiscal 1947, resulted instead in a $1.5 billion increase. The Revenue Act of 1948, which was expected to reduce collections by more than $4 billion in fiscal 1949, actually brought individual income tax collections down by $3 billion.

The same thing seems to have happened in Canada,



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Whirlex shop assembled units are most economical because–

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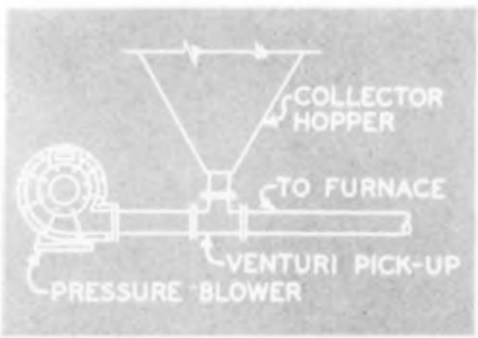

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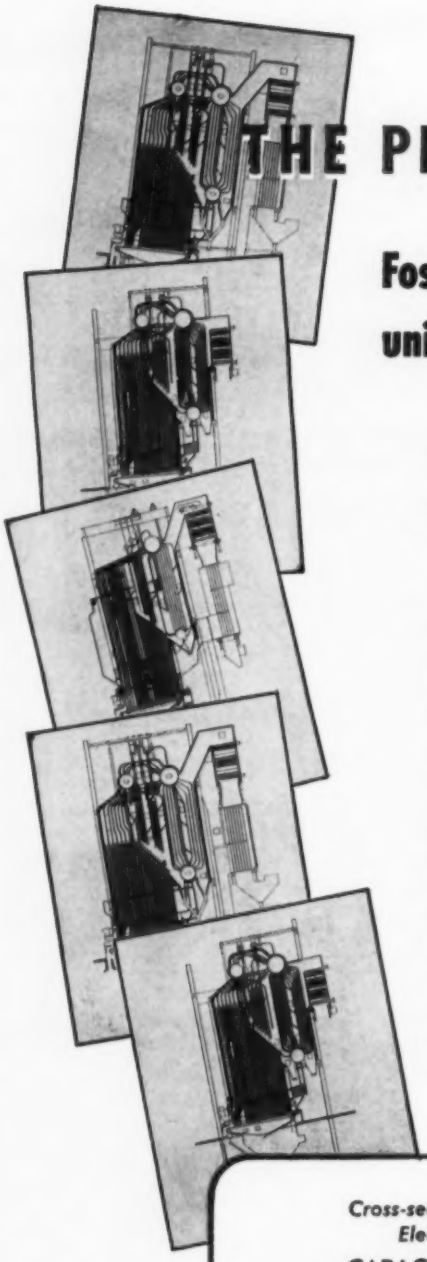

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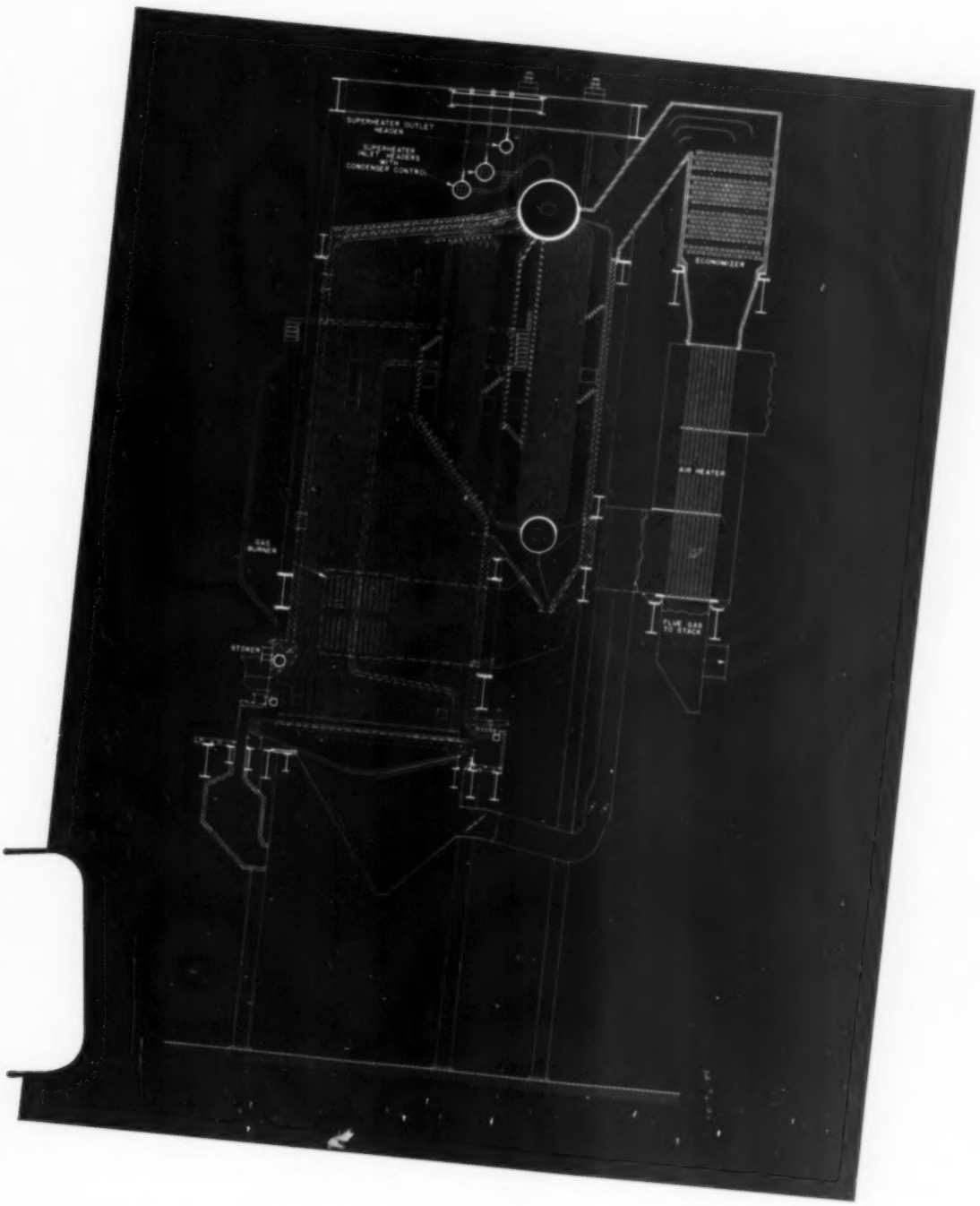

where there have been tax reductions in all the fiscal years 1946 to 1951. In many cases, actual receipts increased instead of going down, despite the fact that sizable reductions in rates were being made. In the other cases, the actual revenue reductions were much less than the anticipated revenue effects of the tax reductions.

It seems evident from this recent fiscal history in the U. S. and Canada that the mild tax reductions here proposed may well have the long-run result of increasing revenues rather than reducing them. I emphasize that "mild" cutback because the relatively minor tax reductions listed here are only the beginning of what must be done to ease the present intolerable tax burden. As soon as humanly possible, these first tax cuts should be followed by others across the board to enable the U. S. economy to operate with a minimum tax burden and thus produce all the wonders of which it is demonstrably capable.

Tax Law Revisions Needed

Accompanying this general reduction in the tax load should be a careful program of tax revision. Imbedded in the present hodge-podge of tax statutes and regulations are provisions that strongly hamper capital formation by weakening the incentives of potential investors. A man is unlikely to risk his savings in a new business if the tax laws seem organized to take away most of any profits he happens to make. He is more likely to put his money in "safe" bonds or in a savings bank. He doesn't gain much but he doesn't lose either, he thinks. On the other hand, the national economy suffers because the U. S. needs these savings to start new businesses, expand production, and make jobs.

An average of $11,000 of capital investment is needed to create a single industrial job. Since some 800,000 young people enter the labor force every year, we can get an idea of the new investment needed annually.

There are many needed revisions in the tax laws to encourage risk capital but here are several that stand out:

"Section 102" of the Internal Revenue regulations. This section imposes penalties on corporations found to have accumulated reserves in excess of "reasonable" needs of their business. Many corporate managements are in constant turmoil over the uncertainty of a large penalty tax under Section 102, should they be unable to prove to the satisfaction of the internal revenue agent the propriety of their current dividend policy. Moreover, many corporations, attempting to avoid trouble under Section 102, feel impelled to pay such heavy dividends that adequate reserves for ordinary business precautions are dissipated.

The minimum that should be done with Section 102 is to shift the burden of proof so that the Treasury must prove that the dividends are "unreasonable" rather than force the taxpayer to prove they are "reasonable." Another good change would be to permit profit from capital gains, now included as income for purposes of Section 102, to be exempted from the penalty tax if they are long-term gains.

There is a second and very important way in which tax revision can generate new capital. This is the matter of depreciation. Everyone admits that the present method of dealing with depreciation is unsatisfactory. Treasury policies on depreciation are a direct handicap to new risk capital. The tools of industry are wearing out at a greater rate than they are being replaced because corporations must follow restrictive and archaic depreciation schedules. Corporations tend to keep their older facilities in operation instead of modernizing them, since they cannot afford to discard older tools and facilities until they are completely depreciated.

At the same time, the whole process is wasteful because of the tremendous sums the Bureau of Internal Revenue spends checking depreciation allowances to corporations.

There is a relatively simple solution which would bring up to date the depreciation practices of the Bureau and cut down the waste motions of its engineering division, not to mention the annoyance and expense to the taxpayer. That solution is to permit corporations to set their own depreciation rates, within limitations. The limitations would be two: first, that depreciation rates be no higher than 20 per cent; and, second, that corporations stick to their schedules, once these are established.

This solution would have the additional merit of not only dispensing with a large part of the engineering division of the Bureau of Internal Revenue, but would save a huge amount of time as well as legal and accounting expense to the taxpayer.

Should we adopt this broad principle of dealing fairly with depreciation, neither the Treasury nor the taxpayer will be the gainer or loser in the long run, but the economy as a whole will gain tremendously. Management will then be free to use its own judgment and initiative in expanding production and creating more jobs.

Finally, a prime area for tax revision is the most important deterrent to the formation of new venture capital, the double taxation of dividends. Perhaps because it is so basic, the problem of double taxation of dividends is more difficult than most. Nevertheless, it must be the long-term aim of any adequate tax revision program for the encouragement of risk capital that double taxation of dividends—once in the form of a tax on corporate profit and again when the stockholder pays his income tax—be eliminated.

Apart from these specific tax revisions, there needs to be a restatement of the entire tax law in shorter, more intelligible terms. For all the predictable future we shall need relatively high taxes to pay for national defense expenditures. A new Congress should seize the opportunity to overhaul the tax system and put it in shape for the heavy costs ahead. Taxes will always be painful for the taxpayer. But they need not be as destructive to economic expansion and to individual incentive as the present hit-or-miss tax system.

The demonstrated demand of the American people for lower taxes and less wasteful Federal spending, plus the great need for extensive tax revision, is a great challenge to the new Administration and the new Congress. This challenge can be met if the South and the rest of the nation insist that it must be met.

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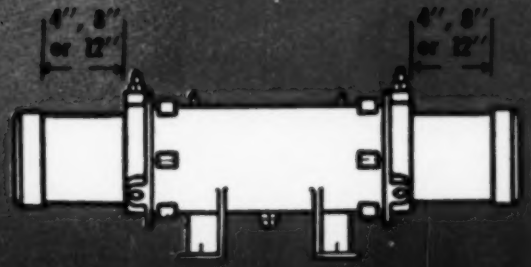

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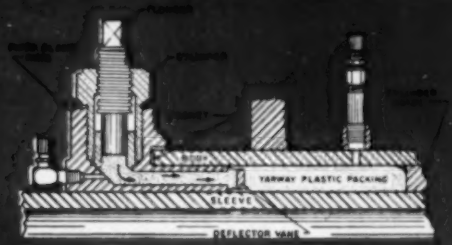

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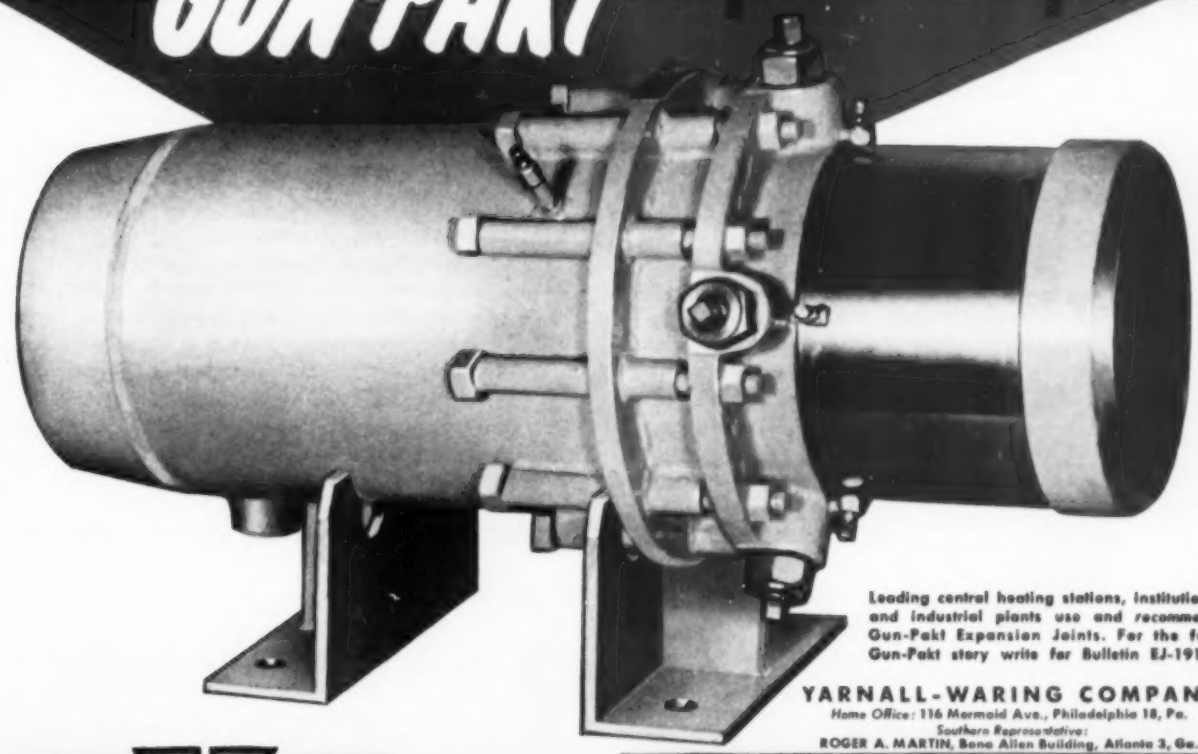

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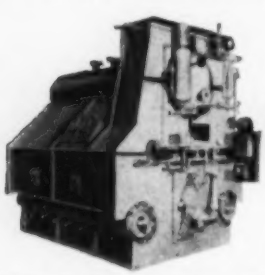

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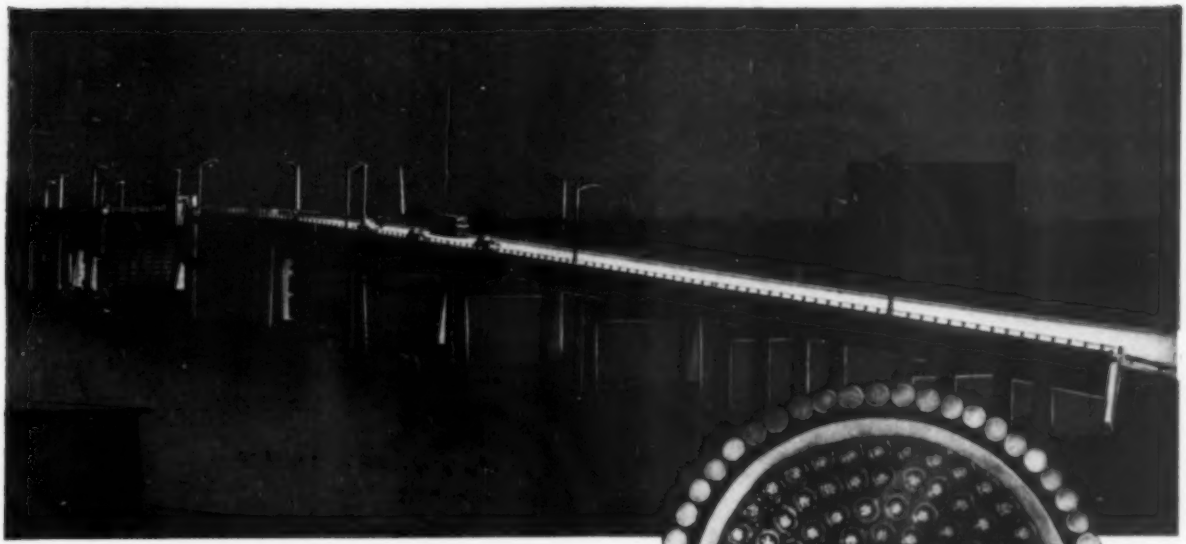

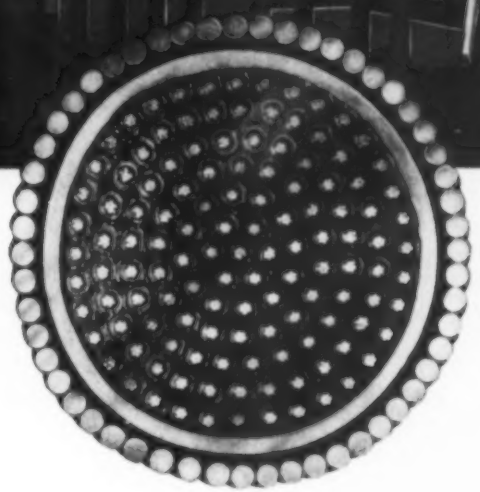

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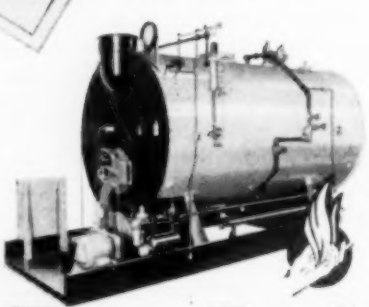

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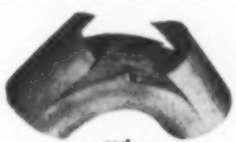

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Control of Plugging and Corrosion

An abstract of the paper, *Air Preheater Design as Affected by Fuel Chracteristics*, presented at the A.S.M.E. annual meeting by *Kilmer Karlson*, Technical Director and *William E. Hammond*, Chief Engineer of the Air Preheater Corporation.

THE fuel characteristic that appears to control the plugging and corrosion of preheaters is the sulphur content, but other fuel constituents also contribute to the trouble. Carbon in the fuel gas may aggravate the corrosion problem, therefore good combustion conditions must be maintained.

It is not possible to predict with certainty the type of fuel that will be available during the life of the preheater, consequently, the design must provide controls that will maintain cold end temperatures within safe limits.

The use of Cor-Ten or Mayari-R for the low temperature surface and the use of cold end baskets is recommended.

Soot blowers using superheated steam or dry compressed air serve as the principal control of deposit formation. And if there is serious deposit formation, provision for water washing will provide an effective remedy.

Metal Temperatures

While the problem of plugging and corrosion in air heaters and economizers looms as a large one, the great majority of installations are basically free of major difficulties, and can be controlled so that forced or unscheduled outages are not required. While it is known that the type of fuel firing equipment and metal temperatures are both factors in the control of corrosion and plugging, it is possible in most cases to deal only with metal temperatures since the other factors are beyond the control of the operator.

The experience of the authors' company regarding acceptable metal temperatures for various fuels is summarized in Fig. 1. These curves indicate the minimum average cold end temperature at any load for the various fuels and firing methods normally employed.

If the design condition is such that these minimum temperatures are approached at full load operation, it will be necessary to provide some means of controlling the metal temperature at reduced loads. Further, in those installations where the ambient temperature can drop appreciably below the designed ambient temperature, it will also be necessary to provide the temperature control at full load operation. It will be noted that Fig. 1 does not show curves for pulverized anthracite, sweet natural gas or stoker firing. The following values are recommended: Pulverized anthracite 150 F, sweet natural gas 160 F, underfeed stoker fired bituminous should be 20 F over curves for pulverized bituminous, and spreader stokers 10 degrees over.

These values are minimal and selection should be made at or above these limits. For design purposes these limits should be compared with the calculated temperature without allowance for leakage. When using these limits as an operating guide, the actual air and gas temperatures may be used.

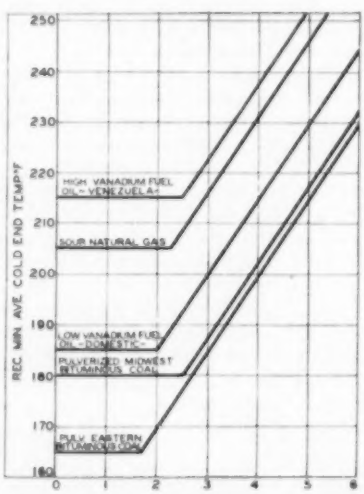

Fig. 1. Curves showing recommended minimum average of the cold end temperatures for various fuels.

In discussing cold end protection, the question naturally arises as to how well these temperatures can be determined. The authors' company with the assistance and cooperation of the engineers of The Detroit Edison Company has established through actual field tests that the measured metal temperatures compare favorably with the average of the cold end air and gas temperatures in the regenerative heater.

Test results indicated that an acceptable margin is provided by using the average of the cold end temperatures. In each instance this average was well below the actual minimum metal temperature. It should be noted, however, that these data only apply to the rotary regenerative type air heater. Due to the nature of the heat transfer process the metal temperature of the regenerative heater is appreciably higher than the recuperative types.

Cold End Protection

The various means for obtaining cold end temperature protection are well known. They are:

1—Cold air by by-pass (Fig. 2)

2—Hot air recirculation (Fig. 3)

3—Steam air heaters

4—Combiflow—parallel — counterflow

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 1 | FEBRUARY 1953 | Number 1

New Water Manual Published by ASTM

Of interest to everyone concerned with industrial water is ASTM's "Manual of Industrial Water," a January 1953 release, prepared by Committee D-19. Manual discusses uses of industrial water, difficulties caused by industrial water, compositions of waters and deposits, treatment, sampling, analysis of water, identification of water-formed deposits.

Research by Hatch Gives New Basic Facts on Threshold Treatment for Corrosion Control

Research papers by Dr. G. B. Hatch of Calgon, Inc., titled "Protective Film Formation with Phosphate Glasses" and "Inhibition of Galvanic Attack of Steel with Phosphate Glasses" provide a better scientific understanding of the mechanism of film formation with Calgon.

Data prove Calgon stops corrosion by virtually eliminating flow of current between anode and cathode in corrosion cells.

Research shows Calgon is a cathodic inhibitor. All cathodic inhibitors are "safe" inhibitors, because they do not increase tendency toward pitting.

Data reveal that protective film is formed by electrodeposition process, and that Threshold Treatment for corrosion is quite different from Threshold Treatment for scale prevention.

Write if you want a free copy of these fundamental papers.

Industrial Water Statistics

According to U. S. Dept. of Commerce statistics, use of industrial water for process has been estimated at 80 billion gal per day during 1950. This is 8 times the quantity required in 1900, although population increase in same 50 years was only 2-fold.

Manufacture of steel, production of electric power require 50 billion gallons of the 80 billion per day. Industrial use of water is estimated to increase 170 per cent from 1950 to 1975, according to Materials Policy Commission.

Pilot Plant Designed for Steel Company Results in Minimum Cost for Waste Disposal

A Pennsylvania steel company had to dispose of wash waters evolved in the manufacture of producer gas.

This wash water contained objectionable quantities of phenol, sulfide, and cyanide.

Preliminary study showed that either chemical treatment, or closing up wash water system could do the job. A Hall Labs staff engineer recommended use of a pilot plant to determine chemical treatment costs. He specified equipment for pilot unit, and provided detailed instructions for operation. Pilot plant showed that all hydrogen sulfide and cyanide and about 90% of phenol could be removed.

But cost analysis of chemical treatment revealed it was 2 or 3 times as costly as closing up system. On this basis, decision was to install a recirculating system for the producer gas wash water.

Major problem in closed system was build-up of suspended solids. Methods of controlling this were studied by the Hall staff, and recommendations made to steel company.

State antipollution requirements were satisfied, and another step taken toward clean natural streams with the minimum cost to industry.

Field Reports on Industrial Water Treatment

Herman Reda, Service Engineer in our Detroit Office, made the following report on a food processing plant in his area:

"Turbines have now operated continuously for 3½ years. Prior to use of Hall System, plant had to clean units every 6 months."

A report on boiler water control comes from Bill Pfeiffer of the St. Louis Office. Report concerns a paper company:

"Client is pleased with silica treatment. After silica had been fed for about 3 months, boilers were opened for inspection, found to be much cleaner than client ever saw before. Heavy sludge usually found in top rear drum and mud drum was almost gone. Silica is also helping out at the filters, and filtered water contains no suspended matter. Client cleaned filters with Buromin—pleased with results."

"Calgon" and "Buromin" are names of phosphate glasses developed by Hall Laboratories for industrial water treatment and marketed, respectively, by its associates, Calgon, Inc., and the Buromin Company who have registered the names in the U.S. Patent Office as trademarks. "Hall System" is similarly registered as a service mark by Hall Laboratories.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., P.O. Box 1346, Pittsburgh 30, Pennsylvania.

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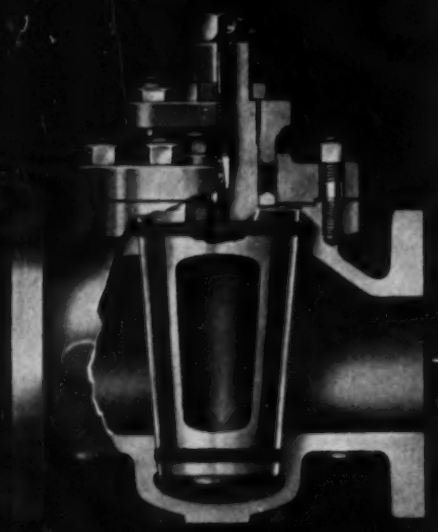

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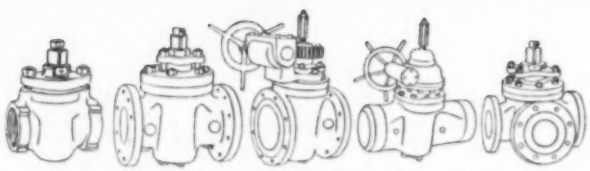

Illustrated in section is a Walworth No. 1700F Regular Gland Type, Wrench Operated, Steeliron, Lubricated Plug Valve. This particular line of valves has a working pressure rating of 200 psi at 150F or 125 psi at 450F. Sizes range from ½ to 8 inches. Other Walworth Lubricated Plug Valves include Single Gland and Ball Bearing types. They are available for a variety of working pressures.

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5—Reduction of surface

With the combiflow method a portion of the air is made to flow in parallel with the flue gas, and by regulating this quantity, a control of metal temperature can be achieved. But to the authors' knowledge, there have not been any installations as yet.

Cold Air By-Passing

Cold air by-passing is probably the cheapest and simplest of the various control methods (Fig. 2). However, its effect upon efficiency is detrimental so that where the control may be required for long periods, it may not be justified. It provides a wide range control so that it many times is combined with more efficient control methods to assure adequate range. To obtain the maximum range particularly at low loads, dampers should be installed in the air duct to insure sufficient flow through the by-pass duct. This method also provides adequate air temperature for pulverized coals. In evaluating this system we have to consider the lower boiler efficiencies, the reduction in fan power, and the cost of two dampers and by-pass duct.

Hot Air Recirculation

Hot air recirculation represents the most efficient method available insofar as the effect of boiler efficiency is concerned (Fig. 3). However, its control range is limited by the quantities of recirculated air required for large adjustments in metal temperatures. For this case, it is preferable to combine hot air recirculations with cold air by-passing, thus the efficiency of hot air recirculation may be realized at all normal conditions, while the occasional demand for increased protection can be obtained through cold air by-passing. It is sometimes difficult to obtain sufficient mill air temperature for pulverized coal firing installations when hot air recirculation is used. For this condition cold air by-passing can be combined with the hot air recirculation so that a suitable air temperature may be obtained.

When hot air recirculation is arranged to utilize the forced draft fan for recirculation, the material for the installation is similar to the requirement for cold air by-passing. A duct is run from the fan suction to the hot air discharge of the air heater. Two dampers are required, one in the recirculation duct and another in the hot air duct down stream from the recirculation duct take-off. This last damper is used to insure adequate flow through the recirculation duct at low loads. It might be mentioned that where the forced draft fan is used for recirculation, difficulty may be experienced in obtaining adequate control where inlet vanes are used on the forced draft fan. This can be overcome by arranging the inlet vane control so that the recirculation duct may connect between the vanes and the fan suction, or by using a separate fan for recirculation.

When the separate fan is used better control is achieved, the recirculation system is independent of the forced draft fan system, and less power is required.

In evaluating hot air recirculation, we must consider the change in boiler efficiency, increased fan power and the cost of the duct, dampers and fan, if a separate fan is used.

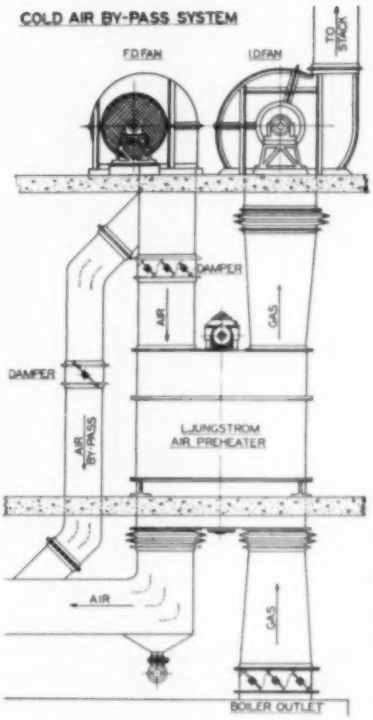

Fig. 2. Cold air by-pass system

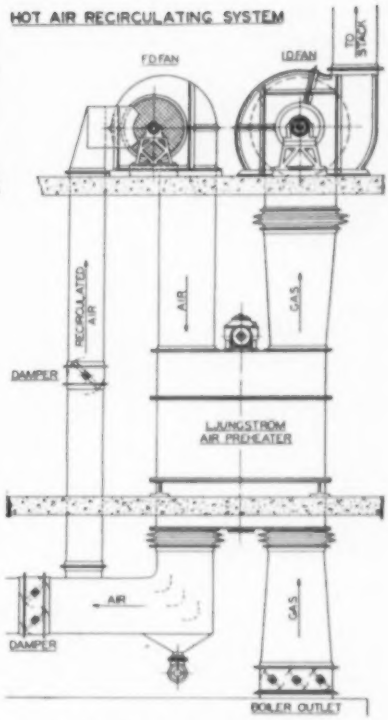

Fig. 3. Hot air recirculating system.

Steam Air Heaters

The steam air heater provides a very acceptable control method. It provides the highest air temperature which is desirable, particularly for low load operation at low ambient temperature. Further, its efficiency is very acceptable particularly if bled steam can be used. While it reduces the gas temperature drop in the preheater below that obtained with recirculation, this reduction can be more than offset by the gain in the regenerative feed cycle efficiency obtained through use by bled steam. The increased air side system resistance caused by the steam air heater exists under all operating conditions whether or not the control is used unless special provisions are made. Other methods increase the system resistance only when the control is in operation. In addition to the cost of the steam air heater, piping, valves, etc., must be included. Further, suitable credit should be claimed if bled steam was utilized.

Another method of metal temperature control that has been

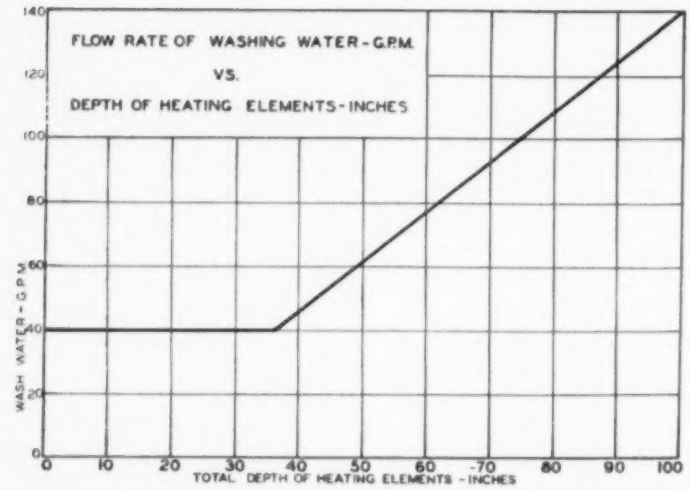

Fig. 4. Flow rate of washing water in gpm vs. depth of heating element in inches.

used involves by-passing of the gases around the economizer in order to raise the gas inlet temperature. This method while increasing metal temperature also increases the air temperature which is desirable. However, the complications introduced in the boiler through this method have not made it particularly popular.

Flue Gas Recirculation

On stoker installations a portion of the flue gas leaving the air heater has been mixed with the combustion air as it enters the air heater. Thus the temperature of the air entering the header is increased with a resultant increase in metal temperature. This method has another advantage for stoker fired installations since the increase in CO_2 content of the combustion air causes a reduction in the grate temperatures.

Evaluation of Methods

The final selection of the most suitable control for a given installation must be based upon economic evaluation of the particular case. Since the factors controlling these evaluations are different for each application, it is not possible to generalize.

The efficacy of various control methods can only be realized if they are consistently used. In this respect it would probably be desirable in considering new installations to weigh carefully the value of automatic controls.

Forced Draft Fan Location

While considering metal temperatures mention should be made of the importance of taking the combustion air from the hottest part of the boiler house. While the advantage achieved is not of prime importance in metal temperature control, it does provide definite gains. Where it is not possible to do this, such as in outdoor installations, it is necessary to provide protection over a greater range of temperatures. Further, in this connection, importance of protecting the forced draft fan inlet from rain, etc., on outdoor installations should be emphasized.

Combustion Air Temperature

Another factor to be considered in the design of air heaters for low temperature operation lies with the selection of the combustion air temperature. A number of investigations point out that with high air temperature and low excess air, the combustion of sulphur can be directed principally toward SO_2. Further, with high air temperature, the combustion should be improved and thus reduce the carbonaceous material entering the gas path. The investigators suggest that where circumstances permit, air temperature be considered up to 1000F.

Cleaning Methods

The soot blower is the commonest device for removing deposits. The effectiveness of the soot blower is dependent to some extent upon the length of the flow passage. While for the average application a soot blower at the cold end is sufficient, special applications may require them at both hot and cold ends. The use of superheated steam or compressed air has proven superior to saturated steam.

Air heaters can also be cleaned by water washing. In some installations the operators prefer to wash the heaters periodically rather than use soot blowers. In other cases, changes in the contemplated operating conditions, after the installation has been completed, such as low grade fuels, low load and low ambient conditions not anticipated, make it necessary to clean the heater by water washing.

Generally speaking, the need for water washing of regenerative air preheaters is remote if the heaters are equipped with modern power operated single or dual nozzle cleaning devices using superheated steam or compressed air. There are however installations where load conditions, type of fuels, or inadequate cold and metal temperature control results in deposit accumulation beyond the scope of the cleaning devices. Under these conditions, water washing is used to remove the deposits.

In any given installation, it may or may not be necessary to add some refinements to permit washing. When washing during outages, the preheater rotor and a cleaning device, used for washing, may often be run at their normal speeds. If, however, it is necessary to restrict the water to one side of the heater, the preheater rotor must be slowed to approximately ¼ rpm. This may be done by a portable air motor attached to the back end of the main drive motor. When low rotor speed is used, it will usually be advisable to control the travel of the washing nozzle to assure that all areas are washed.

Water washing may be carried out on either air or gas side,

(*Continued on page* 152)

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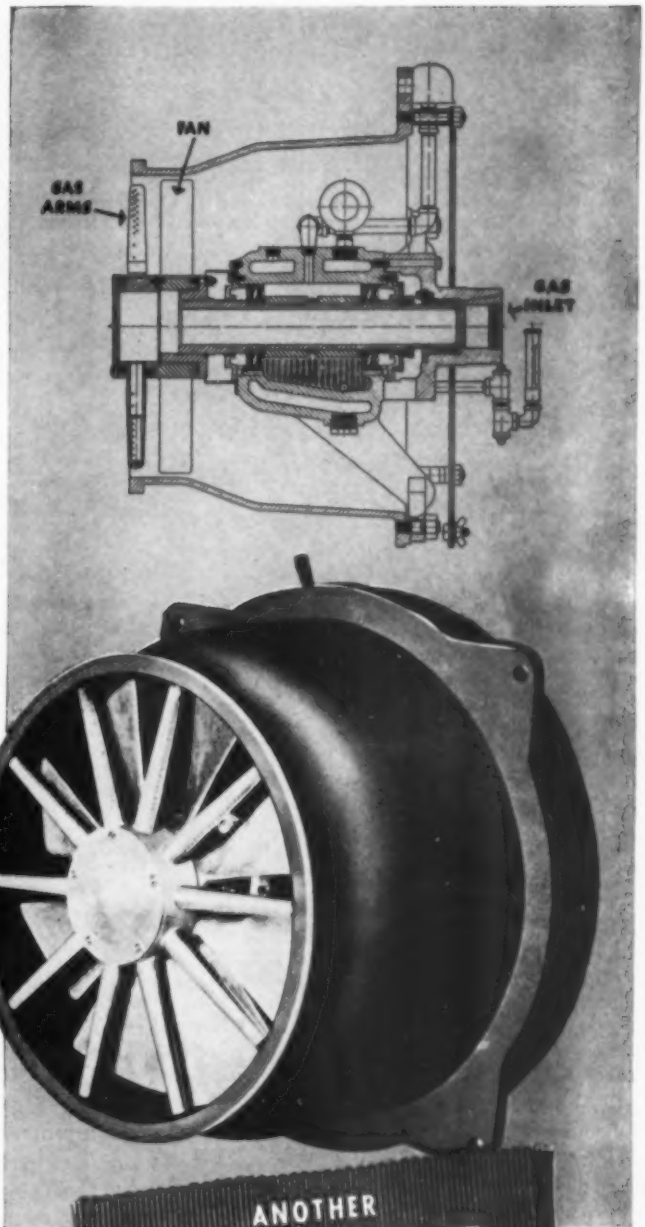

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Electrical Equipment Fundamentals

By A. T. LOHKAMP, Superintendent of Power Plant,
Pasco Packing Co., Dade City, Florida

Part 2—Distribution and Controls

This is the second of a series of 7 "Q & A" articles presented to help plant men become more intimately acquainted with the electrical equipment in their charge. A thorough understanding of the points covered will improve operation and maintenance, and help employees advance to higher positions.

Installments of this Series Include:

Part 1—Operation and Maintenance	*Jan. '53*
Part 2—Distribution and Controls	*This Issue*
Part 3—Synchronous Motors	*Mar. '53*
Part 4—Three Phase Induction Motors	*Apr. '53*
Part 5—Single Phase Motors	*Jun. '53*
Part 6—Technical and Design Data	*Jul. '53*
Part 7—Selecting Generators and Motors	*Aug. '53*

Q—What is a circuit breaker?

A—A device designed to open a current carrying circuit without injury to itself. The term as used in the National Electrical Code applies to the automatic type which is so designed that it will trip at a predetermined and preset overload of current.

Q—What are the two principal types of circuit breakers? How are they operated?

A—The two principal types are the oil immersed and the air breaker type. The oil circuit breaker (OCB) operates in an oil bath where the oil serves to break and quench the arc as well as serving as a cooling agent. The air circuit breaker operates in the open without benefit of oil immersion. Air breakers are usually equipped with arc shields and arc suppressors. Circuit breakers may be manually operated through linkage and a lever or they may be operated by solenoid, electric motor or air pressure.

Q—Why are circuit breakers necessary?

A—The primary use of circuit breakers is as a switch and protective device. They are needed to protect equipment from the terrific surges of current which will flow in case of a ground or short circuit. The magnitude of the current flowing in event of a short circuit on a high voltage system depends upon the generator capacity supplying the current, and the motors and equipment operating. In house wiring the small breaker or fuse serves to prevent fires from overheated wiring or shorts. In industrial plants, circuit breakers protect operating equipment and prevent fires.

Q—What is a controller?

A—A device or group of devices which serves to govern in some predetermined manner, the electric power delivered to the equipment to which it is connected. An excellent example is the step starter used to operate a wound rotor motor at various speeds.

Q—If a piece of equipment is rated for continuous duty, what is meant? For intermittent duty?

A—If rated for continuous duty it means that it will operate at substantially constant load for an indefinitely long period of time.

Intermittent duty means operation for short periods of time at full load and the rest of the time at low load or no load.

Q—What are feeders?

A—Feeders are the conductors between the power supply and the branch circuits that serve the power-using equipment.

Q—What is an isolating switch?

A—A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating and is operated only after the circuit has been opened by some other means.

Q—What is a motor-circuit switch?

A—A motor-circuit switch is rated in horsepower, and is capable of interrupting the maximum

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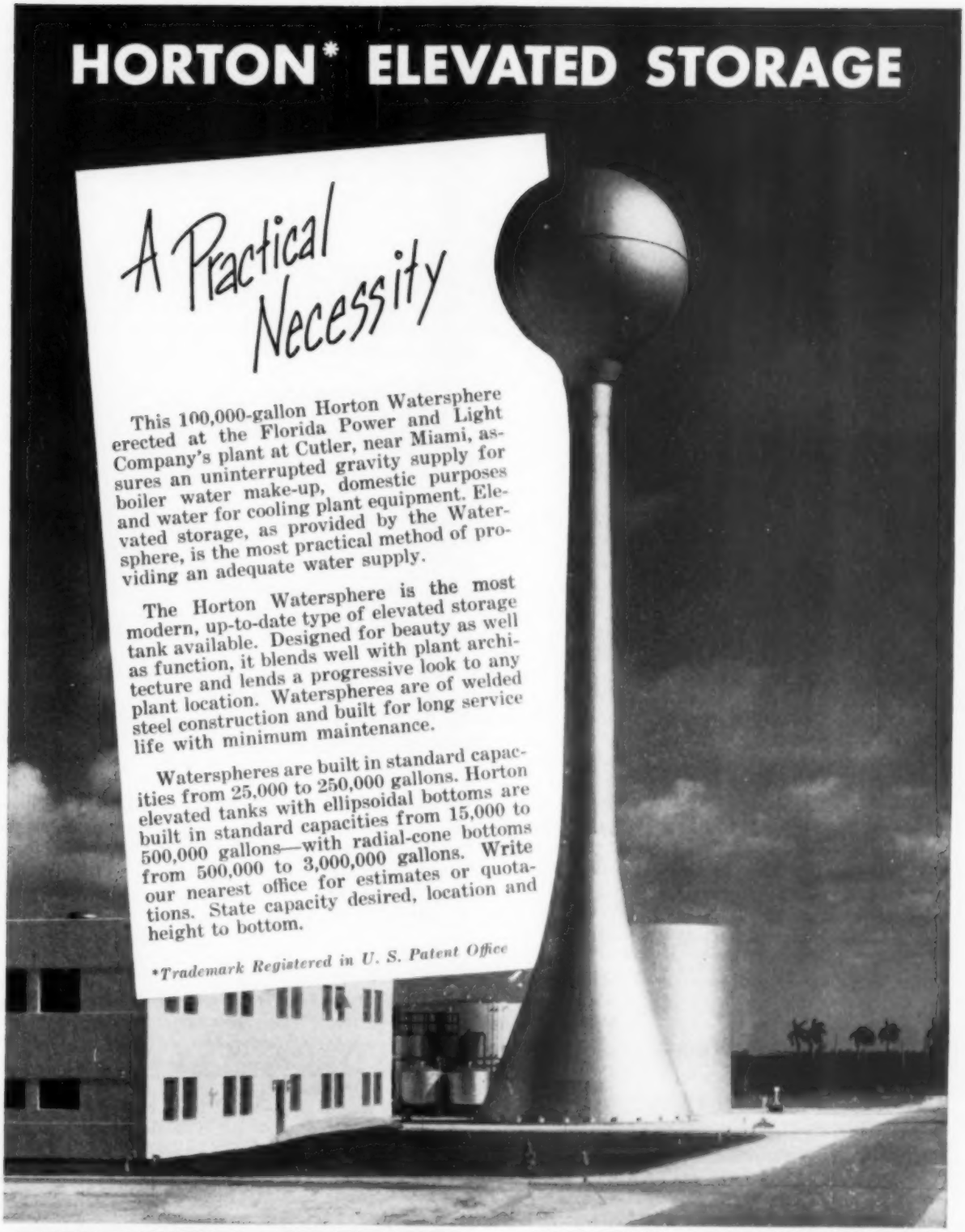
HORTON* ELEVATED STORAGE



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operating overload current of a motor of the same horsepower at the rated voltage.

Q—What are the most frequently used systems of wiring distribution?

A—The most frequently used systems are the Delta and Wye. The Delta may be divided into the closed and open Delta with the closed Delta system being the most frequently used. The Wye system may be either grounded or ungrounded, but the grounded Wye is much more frequently used than the ungrounded system.

Q—Will a circuit breaker open in case of ground on an ungrounded Delta system?

A—If one phase only of an ungrounded Delta system is grounded, the breaker will not open the circuit. It requires a short across two phases or two phases grounded to cause the circuit breaker to open. On the grounded Wye, if one phase is grounded the breaker will open, if there is a short across two phases it will open. If the Wye is ungrounded it will behave the same as an ungrounded Delta system.

Q—What voltage could be expected from the secondary of a 2400 to 240 volt transformer bank connected Delta? Connected Wye grounded?

A—Between any two phases of a Delta system the voltage would be 240 volts on the secondary. Between any two phases of a grounded Wye the voltage would only be about 216 volts while the voltage between any one phase and ground would be 120 volts.

Q—What is a transformer, how is it constructed, and what determines the secondary voltage?

A—A transformer is a device having no moving parts, which may be designed to decrease or increase voltage. A transformer is constructed by winding insulated copper wire around a laminated iron core.

There are two separate windings with no electrical contact between the two. But both windings are wrapped around the same laminated iron core. As the a-c voltage in the primary coil goes through its cycle from 0 to full voltage it magnetizes and demagnetizes the iron core. Then on the secondary winding we have the reverse action—changing magnetism in the core induces voltage in the secondary winding. The job is done by the varying magnetic flux in the iron core. Transformer action is dependent on the varying voltage; therefore it will not work on a d-c circuit without some special mechanism to vary voltage. Normally, in industrial work the transformer is strictly an alternating current device.

Q—What determines the voltage change that a transformer can produce?

A—The increase or decrease in operating voltage is determined by the ratio of the number of turns in the primary and secondary windings. If the primary winding has twice as many turns as the secondary the voltage will be cut in half. If the ratio is 3 to 1, the voltage will be divided by 3—and so on.

Q—Can a transformer also be used to increase voltage?

A—Yes! Just connect it oppositely. Then with twice as many turns in the secondary winding as in the primary, the voltage will be doubled.

Q—Why are the cores of transformers built up of laminations or thin sheets?

A — Laminations are used to build up the core to prevent saturation with magnetic flux. If they were not laminated the core would become a permanent magnet and the transformer would not work.

Q—What are instrument transformers? Why should they be used?

A—Instrument transformers are current and voltage transformers used in connection with instruments, meters, and control circuits. Measuring instruments and relays in alternating current circuits should not be connected directly to high voltage circuits but should always be connected through instrument transformers. The use of these instrument transformers has made it possible to standardize electrical instruments to operate at 110 volts and 5 amperes.

Q—What is a P.T. or potential transformer?

A—The potential transformer is the voltage transformer used on instruments, usually wound to deliver 110 volts on the secondary circuit. The secondary is connected to the instruments. The low voltage circuit should always be grounded to eliminate static from the instruments and protect anyone who might come in contact with them.

Q—What are C.T.'s or current transformers?

A—Current transformer primary windings consist of one or more turns of heavy wire around an iron core connected in series with the line. The secondary winding consists of many turns of finer wire connected to ammeters, relays or other instruments.

Q—Other than reducing the secondary voltage or current, what good purpose is served by instrument transformers?

A—They isolate the high voltage and high current from the instruments and other places where they may be easily contacted by workmen. One precaution which must always be observed is this: *The secondary of a current transformer must never be opened while the primary is energized.*

Q—What is an auto-transformer?

A—An auto-transformer differs from the standard transformer in having only one winding with a portion of the winding serving as both primary and secondary. Auto-transformers are usually provided with several taps for obtaining the desired secondary voltage. They are used for reducing the voltage or in compensating for

(*Continued on page* 106)

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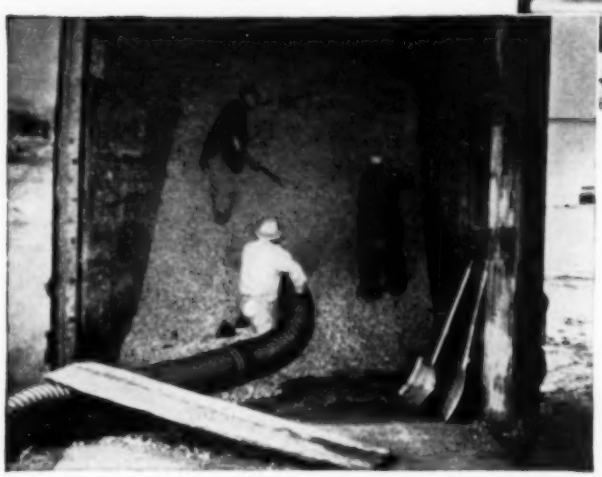

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voltage drops in transmission lines. Auto-transformers are less expensive, operate at higher efficiency, and have better voltage regulation than the standard two-coil or multi-coil type of transformer.

Q—Why not use auto-transformers on all applications?

A—Auto-transformers are not used for stepping the high transmission voltages down to service voltage because there is a possibility that the section of winding common to both primary and secondary may become open. If this were to happen the secondary would carry high voltage. Also, if the primary were to become grounded it would establish a high voltage between one of the low voltage lines and ground.

Q—What is a tap-changer?

A—A tap-changer is a device for changing the turn ratio inside a transformer tank. The handle of the changer is extended outside the tank for easy accessibility. Since it may be necesary to change the turn ratio at times of seasonal load change, it is a relatively simple matter to do this by operating the tap charger without getting inside the tank of the transformer where serious mistakes might be made.

Q—How are transformers cooled?

A—Transformers are generally cooled by housing them in a tank where the coils are submerged in oil. The oil serves as a cooling agent and as insulation. Moderate size units are usually housed in a corrugated cast iron tank or may be in a steel tank with external tubes or radiators to increase the cooling surface. Some large units make use of a fan to force air circulation. Some large units are equipped with pumps to circulate the oil through heat exchangers using water as a cooling agent for the oil.

Q—Why is electricity transmitted at as high a voltage as possible?

A—If voltage is increased the current will decrease in direct proportion. Therefore, since conductor size is dependent upon the amperage, smaller conductor may be used at high voltage. Much money can be saved on long lines by transmitting the power at high voltage over small conductors.

Q—What is an M. G. set?

A—An M. G. set is a motor generator set consisting of an a-c motor and a d-c generator. It is used to supply d-c current for exciting alternators, synchronous motors, for charging batteries, etc.

Q—How else can direct current be made available from an a-c supply?

A—Alternating current can be converted to direct current by means of rectifiers which have high resistance to current flowing in one direction and low resistance to current flowing in the opposite direction.

Q—Is an ungrounded Wye wiring system often used?

A—No, an ungrounded Wye will probably be found only in emergency cases since voltage regulation is very poor on this system.

Q—Is an open Delta wiring system very frequently used?

A—The open Delta distribution system is quite frequently used. Since 80 per cent of the capacity of two connected transformers can be utilized, the open Delta is often used to save the cost of the third transformer. In event of the failure of one transformer on a closed Delta system the remaining two transformers can be connected open Delta to supply emergency current.

Q—An alternator designed for 2400 volts Delta is connected grounded Wye. What would be the voltage? Would the alternator take this change?

A—The voltage of the Delta system reconnected for a grounded Wye would be 4160 volts. Ordinarily, if there is any likelihood of this change being made the alternator should be purchased to produce 4160 volts Wye, otherwise there may not be quite enough insulation on the coil turns or end windings to take the higher voltage.

Q—What is demand factor?

A—The demand factor of a system is the ratio of the maximum demand of the system to the total connected load of the system. The above may apply to a part of the system, also.

Q—What is a power factor clause?

A—In many localities power companies place a penalty on any industrial user of their current if the power factor of the plant is below a certain pre-set minimum. The rate paid for current increases if the power factor decreases below the minimum.

Q—Will water conduct an electric current?

A—Pure water will not conduct electricity to any extent. The greater the amount of impurities the better the water will conduct electricity. Nearly all water commonly encountered in industry is a conductor.

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Refractory Settings for Boilers Burning Wood Waste

Will the furnace supply all heat needed to generate steam? Will it incinerate all of the waste fuel? Will the refractories selected withstand the heat?

By WALTER B. BRYANT
Bryant Service and Supply Co.
Jacksonville, Florida

SINCE the publication of an article "Refractories for Wood Waste Boilers" in the Feb., 1951, issue of SOUTHERN POWER AND INDUSTRY, there have been a number of requests for additional information covering the design of boiler settings for this type of service.

Two installations have been selected for discussion which have been installed since the publication of that article: Darby Lumber Company, Jacksonville, Florida; and Brice Lumber Company, Archer, Florida. These two installations will be here considered in some detail.

DARBY LUMBER COMPANY

The Darby Lumber Company setting serves a 150 hp, horizontal return tubular boiler. This 72" x 17' 11" boiler is gallows frame hung, steel encased, and has an extended front. Tubes are 4" in diameter. It was planned to operate at 175 per cent maximum rating, and efficiency was assumed at 70 per cent.

The Dutch oven setting was designed to burn sawdust, shavings and hog fuel; and the boiler provides 125 pound steam for operation of kilns and prime movers.

The setting was designed to perform a dual purpose: (1) To manufacture steam for prime movers and dry kilns, and (2) to act as an incinerator for the consumption of a maximum amount of waste products.

Fuel

Very few mill owners have more than a hazy idea of the moisture content of the fuel they are burning. Preliminary tests should be made to determine the moisture content of the different fuels to be burned, as was done in this case.

References:
F. H. Norton—Refractories; C. S. Gladden—Paper June 9, 1930 Power Div., A.S.M.E.; Walter B. Bryant—Industry & Power, Sept., 1943; Walter B. Bryant—Southern Power & Industry, Feb., 1951; Six Place Tables—McGraw-Hill Pub. Co.

Planing Mill Refuse

(Sawdust and shavings)
Weight—8 lb per cu ft
Per cent Moisture—7½
Btu per lb (Fig. 1)—8000
Burning Rate, cu ft per hr—150

Saw Mill Refuse

(Sawdust and hog fuel)
Weight—19 lb per cu ft
Per cent Moisture—64
Btu per lb (Fig. 1)—2300
Burning Rate, cu ft per hr—60

Calculations

The following calculations were made from the data given above, to determine the furnace volume needed to handle the consumption of fuel required to give 175 per cent rating.

Boiler hp x maximum boiler rating x Btu per boiler hp ÷ the assumed boiler efficiency =

(150 x 1.75 x 33,475) ÷ 0.70 =

12553000 Btu per hour.

Assuming that the two types of fuel are fed in equal quantities over a given time, we arrived at the following:

TABLE I—LOADS IN A CATENARY
in terms of s for different values of s/h

s/h	m	x/m	cosh x/m	sinh x/m	L	W	θ	R	H
0.5	0.4050	0.247	5.9534	5.8690	2.367	2.367	80.3	2.40	0.40
1.0	0.6188	1.616	2.6158	2.4172	1.486	1.486	67.5	1.61	0.62
1.1	0.6625	1.509	2.3717	2.1495	1.424	1.424	65.1	1.57	0.66
1.2	0.7065	1.415	2.1798	1.9468	1.375	1.375	62.8	1.54	0.70
1.3	0.7520	1.330	2.0228	1.7583	1.322	1.322	60.4	1.52	0.74
1.4	0.7977	1.255	1.8960	1.6114	1.284	1.284	58.2	1.50	0.80
1.6	0.8870	1.127	1.7045	1.3812	1.226	1.226	54.1	1.52	0.89
1.8	0.9800	1.020	1.5669	1.2063	1.182	1.182	50.3	1.53	0.97
2.0	1.0750	0.930	1.4645	1.0700	1.150	1.150	47.0	1.57	1.07
3.0	1.5500	0.645	1.2154	0.6907	1.071	1.071	34.6	1.88	1.56
4.0	2.0500	0.487	1.1208	0.5064	1.038	1.038	26.8	2.30	2.05
5.0	2.5000	0.400	1.0811	0.4108	1.027	1.027	22.3	2.70	2.50
6.0	3.0000	0.333	1.0559	0.3370	1.011	1.011	18.6	3.18	3.12

L = m sinh x/m R = cosec θ t = thickness of arch in ft
W = L td H = W cot θ d = 133.3 = lb/ cu ft of refractory

TABLE 2
Coordinates from which load line of catenary on drawing (Fig. 2) were evolved

x	x/m	cosh x/m	y	y—m
0	0.000	1.0000	32.27	0.00
4	0.124	1.0077	32.52	0.25
8	0.248	1.0309	33.27	1.00
12	0.372	1.0610	34.24	1.97
16	0.496	1.1256	36.34	4.07
20	0.620	1.1984	38.66	6.39
24	0.743	1.2890	41.59	9.32
28	0.868	1.4010	45.21	12.94
32	0.991	1.5337	49.50	17.23
36	1.115	1.6874	54.44	22.17
40	1.239	1.8693	60.31	28.04
42.9	1.333	2.0298	65.28	33.01

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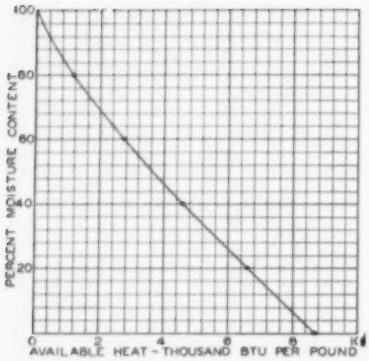


Fig. 1. Curve showing how available Btu in wood waste fuel varies with per cent moisture content.

(8 x 8000 x 150) ÷ 2 = 4,800,000 Btu
(19 x 2300 x 60) ÷ 2 = 1,311,000 Btu

Total = 6,111,000 Btu

(150 x 8) ÷ 2 = 600 lb
(60 x 19) ÷ 2 = 570 lb

Total = 1170 lb/hr

6,111,000 ÷ 1170 = 5223 Btu/lb

12,533,000 ÷ 5223 = 2400 lb refuse burned per hr

Grate area 6'6" x 8'0" = 53 sq ft

2400 ÷ 53 = 34 lb per sq ft of grate surface per hr

It was decided to use super duty refractories in the furnace and No. 1 in the combustion chamber. With a maximum Btu generation of 12,553,000 and a safe Btu release of 30,000 Btu per cu ft of furnace volume, we have:

12,553,000 ÷ 30,000 = 418 cu ft of effective furnace volume

This would be ample for operation at 175 per cent rating, and would give a maximum service life for the refractory lining. But it is still necessary to see that ample capacity is available for incineration.

Setting

The writer knows of no royal road to laying out a Dutch oven boiler setting, but at least we have the factors given above to work from. Where the boiler is to be installed there are usually some external limitations which have a bearing on the final installation drawing. Fig. 2 shows the arch design for the installation finally accepted. The effective furnace volume was as follows:

Volume under the arch	224 cu ft
Volume in front of the arch	58
Volume above the bridge wall	39
Effective vol. of comb. chamber = ⅓ total	270
	591 cu ft

With an effective furnace volume of 591 cu ft the allowable Btu release becomes 30 x 591 = 17,730,000 Btu. Then, since the heat value of the waste products is 5,223 Btu per pound, the refuse that can be safely burned is 3,400 lb per hr.

Thus, the increase of effective furnace volume over the 418 cu ft required to maintain 175 per cent rating will be more than enough to take care of the dual purpose of acting as an incinerator, and satisfactorily dispose of all refuse.

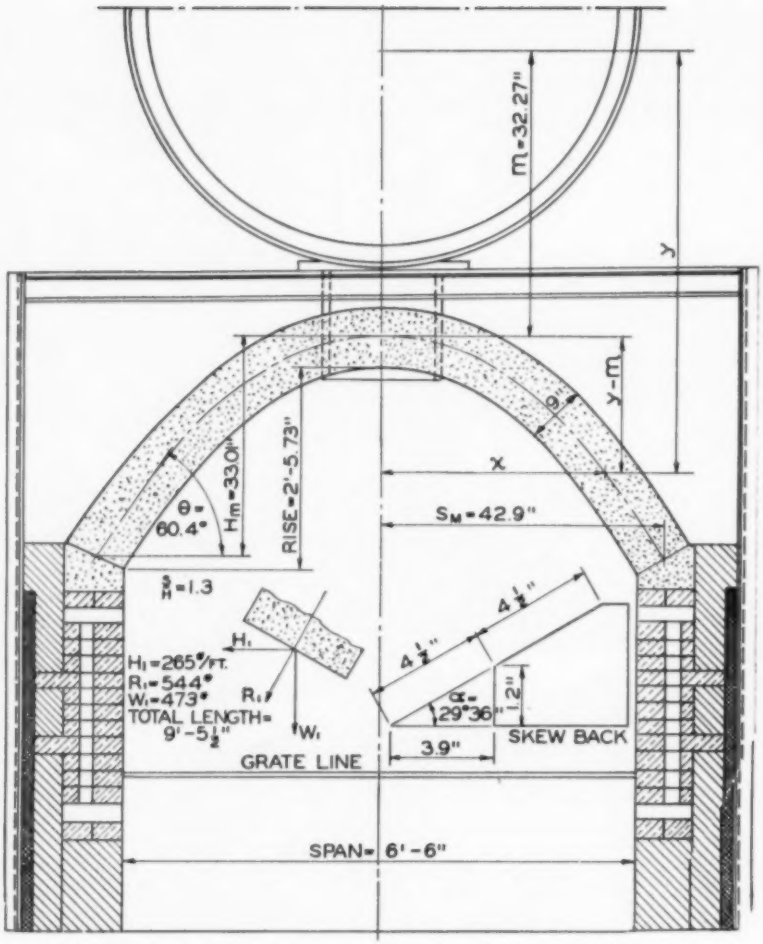
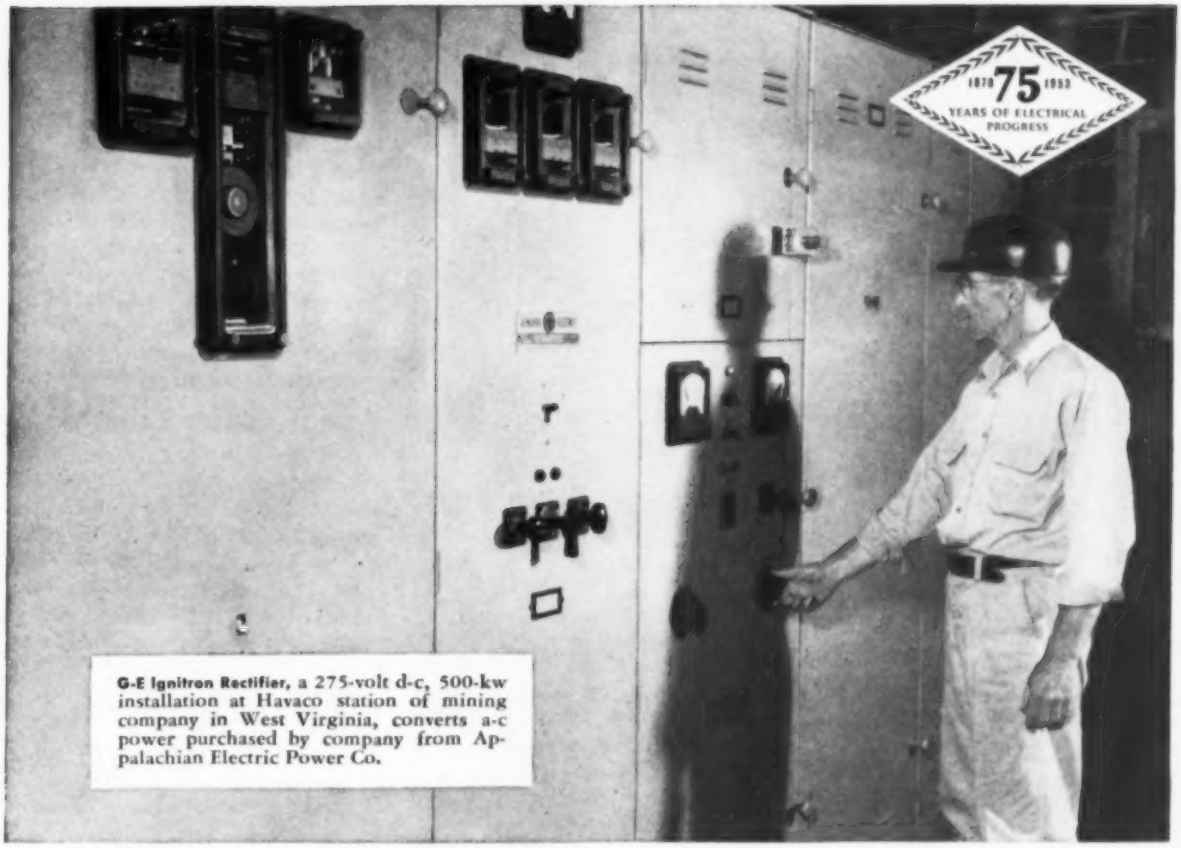


Fig. 2. Design of the catenary arch for the HRT, wood refuse burning boiler of Darby Lumber Company, Jacksonville, Fla.

Arch Construction

A catenary arch was installed over the Dutch oven. The details of this arch are shown in Fig. 2.

There are two basic reasons why a catenary arch is to be preferred over a true circle arch for this application. First, the load line of an arch, whether it is a true circle or a catenary, is a catenary curve. Therefore in a catenary arch the load line follows the center line of the arch and is the most stable



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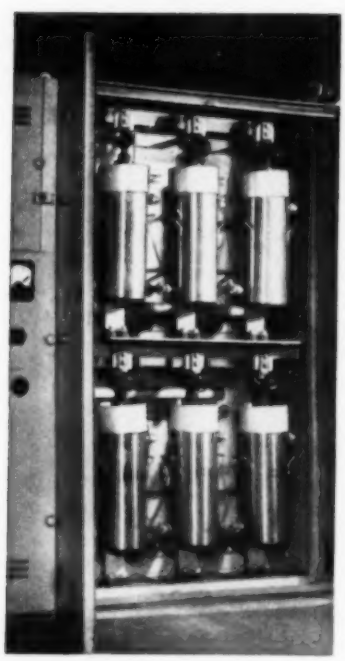

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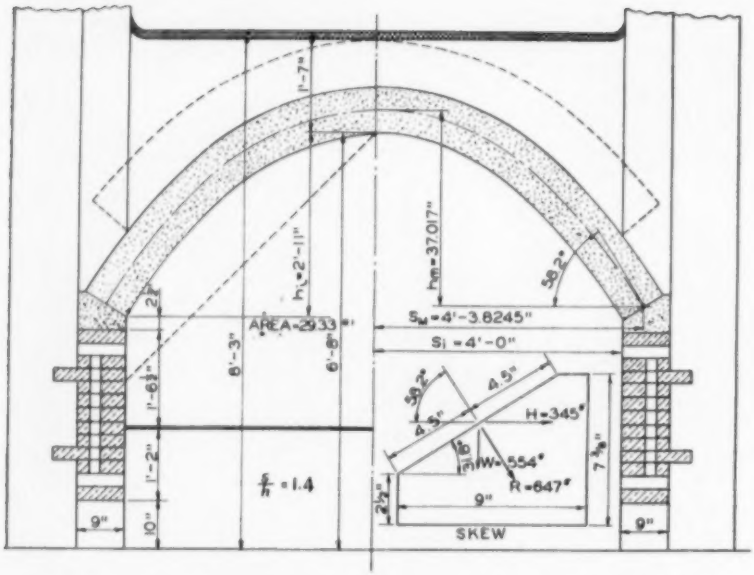


Fig. 3. Design of the catenary arch for the water tube boiler of Brice Lumber Company, Archer, Florida.

form of construction that can be installed. Second, the skew back angle of the catenary is 29°-38′ where with a true circle arch having the same s/h the skew back angle is 15°-0′. The side thrust is 544 lb per ft horizontal length of the catenary arch whereas the horizontal side thrust of the true circle arch is 126 lb. This materially helps to hold the side walls in a vertical position.

Table No. 1 shows the loads in a catenary in terms of s for different values of s/h.

Table No. 2 gives the coordinates from which the load line of the catenary shown on Fig. 2 were evolved.

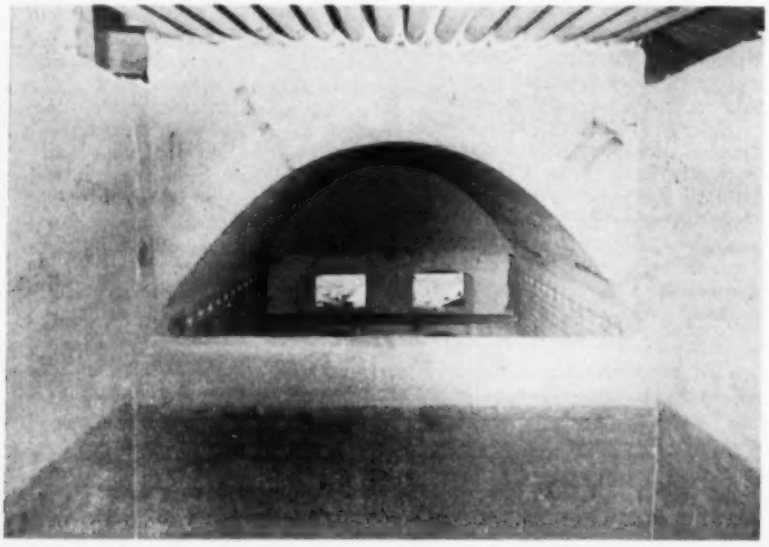
Hollow Wall

Hollow wall construction was chosen for the side walls under the arch in the furnace section. Unlike coal, wood burns from the top down. The introduction of preheated air over the fire will materially assist in complete combustion of the fuel.

This is particularly true of this installation because most of the fuel fed to the furnace has a moisture content of 64 per cent.

Actual service conditions have shown that to furnish steam for the dry kilns and the prime movers at 125 lb pressure the furnace must be chock-a-block full. With this depth of fuel bed only the introduction of preheated air over the fire will maintain complete combustion. This fact has been proved by the small amount of smoke emitted from the stack.

Fig. 4. The Dutch oven of the Brice Lumber Company boiler, seen from behind the bridge wall.



BRICE LUMBER COMPANY

The Brice Lumber Company setting serves a 250 hp, straight tube, water tube boiler. The maximum rating is 200 per cent, and efficiency is assumed to be 75 per cent. Fuel consists of sawdust and shavings with 20 per cent moisture content. Btu value (see Fig. 1) is 6564 Btu per pound.

Btu input required:

$$(250 \times 2 \times 33{,}475) \div 75 = 22{,}450{,}000 \text{ Btu/hr}$$

Maximum Fuel Consumption:

$$22{,}450{,}000 \div 6564 = 3420 \text{ lb/hr}$$

Superduty refractories having a safe Btu release of 30,000 Btu per cu ft of furnace volume were installed.

$$22{,}450{,}000 \div 30{,}000 = 748 \text{ cu ft effective furnace volume.}$$

The length of the grates to be installed was established as 9 feet.

Fig. 3 shows the catenary arch and hollow wall construction. The crown of the arch should be 19" below the front header. This allows for 9" of arch, 9" of curtain wall arch and 1 inch of insulation. Since we installed hollow wall construction the top openings in the wall had to be above the slope angle of the fuel bed. Having no control over the depth of fuel bed we figured the apex of the slope angle at the crown of the arch. This is shown by the dotted line, Fig. 3. This determines the location of the skew back in relation to the apex of the arch.

The volume under the arch and over the grates was 264 cu ft. The volume back of the bridge wall was 493 cu ft, or a total of 757 cu ft. This conforms closely with

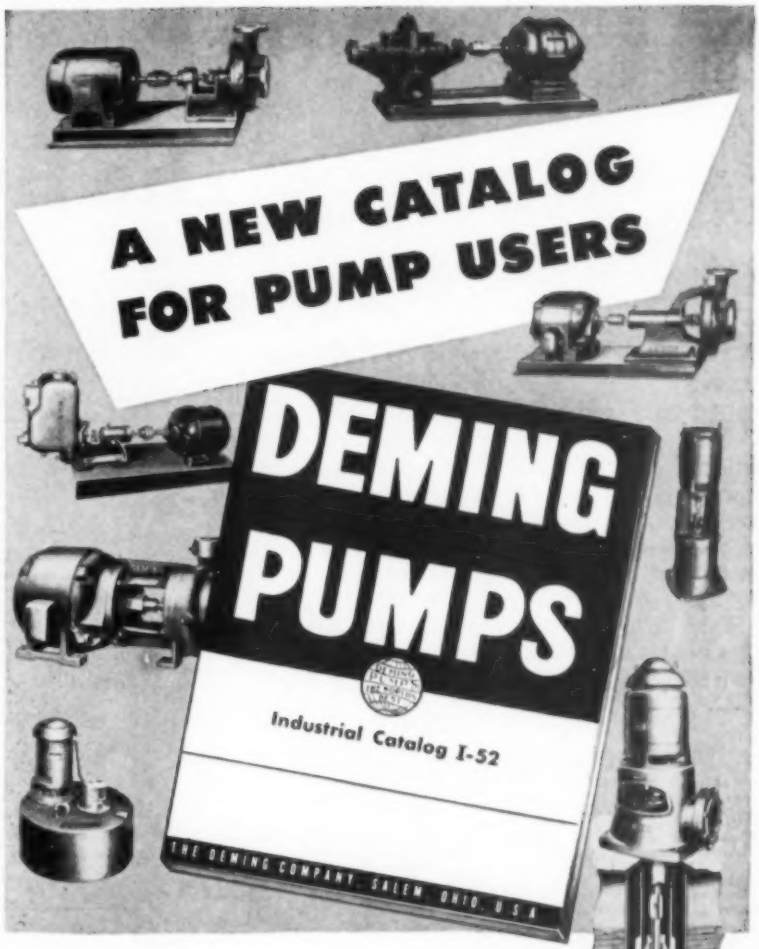
(*Continued on page* 142)

Maintenance of Conveyor Belting

Giving your belting proper attention? These maintenance procedures start on page 79. Check the illustrated vulcanizing technique.

the belt, or longitudinal rips have occurred, these points must be cleaned, sanded, cemented and reinforced with rip plates at three-inch intervals. Transverse rips require similar treatment with standard belt fasteners instead of rip plates. Use rip plates on longitudinal rips only, and standard fasteners on transverse rips only. When holes in the belting do not permit the simple use of rip plates and fasteners, cut out the hole into the smallest possible rectangle with its sides parallel to and at right angles to the belt edges. Then, from belting remnants, cut an exact fit for the hole and insert the piece, fastening it with belt fasteners all around the patch. Cement all edges thoroughly. Where it is necessary to prevent seepage of fines through belt repairs, remove one ply of fabric from a belt remnant and place it under the fasteners and rip plates.

Vulcanized patches are superior to those described above, but require the addition of a portable vulcanizer, rubberized fabric, tie gum, cover stock, a one-ply knife and fabric pliers. In preparing a vulcanized patch, work down into the damaged belt as far as necessary by removing progressively smaller blocks of fabric with each successive ply. Clean, roughen and and cement the cavity, neatly fit in blocks of new fabric and finally apply the uncured cover. Skive the edges of the patch flush, and vulcanize. Such patches cannot be made successfully unless the belt is dry, because moisture will form internal steam blisters. For this reason, large users have drying racks in their maintenance shops. Only large users of conveyor belting will find it economical to vulcanize their own belt patches and splices. Small users may call on the manufacturer or his distributor for splicing and repairs.



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Do you still carry a crank in the car trunk?

Banning The By-Pass

Comments by JOHN A. WEBER,
Maintenance Engineer
Board of Texas State Hospitals and Special Schools, Austin, Texas

THE EVOLUTION of a process usually includes three steps: the process is controlled manually; automatic controls are added but the manual by-pass is kept "just in case"; and then the manual provisions are eliminated unless absolute continuity of service is essential and an operator is always available to "take over" immediately upon failure of the automatic control.

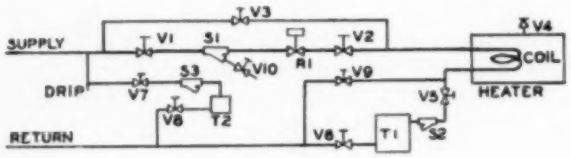
Your automobile is a familiar case. First a crank was used for starting. Then the "self-starter" was added and the crank placed in the trunk. And finally the crank was omitted. The purpose of this brief discussion is to "omit the crank" in the case of steam coil water heaters or heat exchangers.

Many design and operating engineers still insist on manual by-passes for the temperature regulator and even the steam trap on heaters such as illustrated.

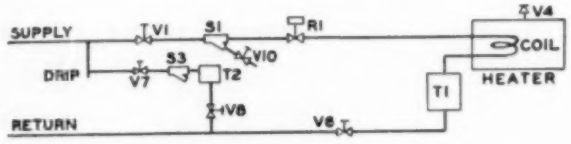
Let's see how far we can simplify this system without impairing its safety or its ability to generate hot water. Remember that the simpler a system, the less it costs to buy and operate.

R1 is the temperature regulator; **S1**, **S2**, and **S3** are strainers; **V4** is the safety valve; **T1** and **T2** are steam traps; **V3** and **V9** are globe by-pass valves; and **V2**, **V1**, **V5**, **V6**, **V7**, and **V8** are gate service valves.

Safety valve **V4** should be designed to protect the system against excess pressure or temperature, and must be sized to relieve the maximum thermal energy which can be transferred to the water with **V3** and **V9** open and **R1** and **T1** open, since there is no guarantee that the by-pass will be opened or left open only when **R1** and/or **T1** are closed off. (Lack of a check valve in the cold water supply to the heater has saved many a tank.)



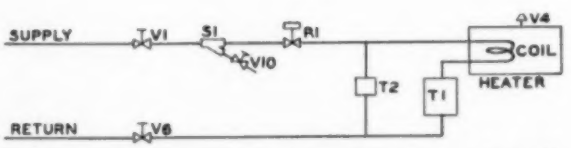
First we remove valves **V3** and **V9**. We can now use a smaller **V4** with safety. We can also eliminate **V2**, since it performs no useful function. And since the inlet strainer **S1** can no longer be by-passed and we can assume no scale will be formed in the copper heating coil, we will also remove **S2**.



We have considerably simplified the installation. We can even omit **V5** if the volume of condensate trapped in the coil after closing **V1** is small or if there is a floor drain or bucket handy. After all, **V5** now only serves to isolate the inlet side of **T1**, a function also performed by **V1**.

But why stop here?

In most instances, the water heater is on one of several short branches from the main steam supply. Once the lines have been blown out with steam and the system operated for a few days, the dirt pocket on a short steam branch is unnecessary. The drip leg becomes a drip leg only and not a waste basket. As such its only function is to guide condensed steam to trap **T2** for discharge to return during periods when **R1** is closed and the heater is in use.



Under these conditions, why not connect trap **T2** as shown here. We can eliminate **S3** certainly, and if we are willing to buy a high quality trap which will require servicing no oftener than **T1**, we can also eliminate **V7** and **V8**. We still have a steam coil water heater of the same capacity as originally, but we have eliminated most of the trouble by eliminating most of the valves and fittings. (We have omitted showing the check valve required in the return line where an overhead return system is used.)

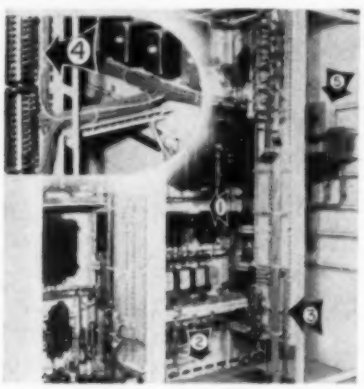
The simplified system will certainly work. But what if something goes wrong? Regardless of which system is used, someone has to notice the lack of hot water, call the maintenance man, and wait for the trouble to be diagnosed and the valves and by-passes correctly set, assuming that **R1** or **T1** have failed in service. Remember that we can maintain a 100 per cent stock of replacements for every **R1** and **T1** in the system with the money we have saved in first cost! Any duplication of units (heaters) will allow less than 100 per cent stock to suffice. And if even this investment is too great, a stock of common sizes of globe valves and odd length pipe nipples will allow the system to be placed on the same manual operation as would have been possible with the by-passes.

Of course it will take a few minutes to change **R1** or **T1** or to insert the globe valves, but remember the time that elapsed before the maintenance man reached the heater! This small additional time must be spent. It is far better to make necessary repairs as the need occurs, rather than wait for the rainy day that never comes to make those repairs.

Panel Developments

HERE is the rear view of a typical automatic control panel incorporating the newest developments in panel design and construction.

Instrument and control engineers in power plants have been continually demanding more instruments at no increase of operating space or sacrifice of maintenance ease. In 1947, Bailey Meter Company of Cleveland put its panel design engineers to work on the project. The results illustrated and described here represent an analysis of several hundred control panel installations. Advancements noted below are keyed to the panel illustration.



(1) Complete accessibility now provided through the utilization of vertical support areas. These are systematically spaced and divide the panel into bays of associated instruments and operating lines.

(2) Control room floor openings and external tubing and wiring conduits may be completed well in advance of panel installation. Panel bay widths are easily determined once the major instruments have been selected and located.

(3) Tubeways have been created to provide centralized distribution points. Panel tubing is concentrated on sturdy vertical supports designed to carry all necessary instrument control lines and meter pressure lines from remote points to panel mounted instruments.

(4) Wireways enclose well-marked, compact, but easily accessible electrical terminal blocks. Installing, testing, and tracing procedures by user can now be done in a minimum of time and with least possible inconvenience or error. Additional terminals may be added without obstruction to existing facilities. Individual wire bundles are now carried out of wireways at points nearest to instrument and switch terminals.

(5) Adjustable wall racks facilitate mounting of any make control boxes, alarms, relays, breakers, etc. This construction also permits installation of additional equipment without welding special mounting pads to panel walls. Old method of welding caused charring of panel walls both inside and out, thus necessitating refinishing and repainting either all or sections of panel walls.

STEEL
ZIPPY
Hot and cold rolled bars, shapes, flats • Structural and junior beams, angles, channels • Stainless • Rigid-Tex • Galvanized sheets, strip, bars and shapes
DIRECT

From Warehouse to you!

Now—from the South's newest and most modern steel warehouse—a larger-than-ever variety of ferrous and non-ferrous products is within reach of your telephone or overnight mail—ready for rapid delivery by rail or truck to any point in the Southeast.

METALLURGICAL SERVICE

Without cost or obligation, the services of our complete testing laboratory and metallurgists are available to help you choose correct metals, find suitable substitutes when necessary and advise on the use of stainless, alloy, high and low carbon steels.

To receive our stock lists as issued, drop us a line or give us a ring.

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WAREHOUSE DIVISION

Atlantic Steel Company

575 FOURTEENTH ST., N.W. • EMERSON 3451 • ATLANTA GEORGIA

NEWSPRINT MILL - - - Calhoun, Tennessee

Bowaters Southern Paper Corporation
Calhoun, McMinn County, Tennessee

This new plant, scheduled for operation in 1954 will make 125,000 tons of newsprint and 50,000 tons of kraft paper per year.

The plant will employ 800 workers and several hundred more will be needed to provide pulpwood. Approximately 3½ million dollars will be paid annually for plant wages and a like amount will be expended for wood.

Chemicals used daily will include: 20 tons of salt cake, 10 tons of caustic, 8 to 18 tons of chlorine, 16 tons of lime, 66,000 gallons of 36 Baume alum, and appreciable quantities of sulphuric acid.

EARLY in 1947 The Bowaters Southern Paper Corporation started a general survey to ascertain the most suitable location for a newsprint mill in the United States. This survey indicated that there is an abundant supply of wood suited to their purpose in the South.

In January 1951, J. E. Sirrine Company, Engineers of Greenville, South Carolina, were retained to make more detailed studies of several sites in the South, which culminated in The Bowaters Organization selecting a location on the Hiwassee River at Calhoun, McMinn County, Tennessee; the site being served by the Southern Railway System.

This location is situated near important coal fields and has a natural gas line nearby. It also offers the facilities for obtaining a large block of power from the Tennessee Valley Authority.

The Bowaters Organization filed application for a Certificate of Necessity on May 25, 1951, which was approved February 19, 1952, and immediately thereafter the J. E. Sirrine Company were authorized to proceed with the final design plans and arrange for purchase of equipment, site preparation, and construction contracts.

Surveys were made for the acquisition of land, the site taking in approximately 1400 acres; and negotiations for a power contract were entered into with the TVA for supplying approximately 17,000 kw.

On June 14, 1952, a contract was entered into with the Oman Construction Company for the general grading, which amounted to about one and one-half million cubic yards. Grading started in June of 1952 and was practically completed by October.

A contract was let to the Raymond Concrete Pile Company on June 27, 1952, for approximately 7200 piles, and the first pile was driven on September 10.

Contracts were also let in August to the Southern Railway System for track material; to A. G. Penuel for temporary construction buildings; and to T. U. Parks for the foundations of the temporary buildings.

On August 5, 1952, a general construction contract for the project as a whole was awarded to Fraser-Brace, and Roane Anderson Companies as joint ventures; and at about the same time contracts were also let to Bethlehem for the steel requirements, and to Grinnell Company for the piping.

Steam for power and process purposes will be generated at 875 psi and 825 F by recovery, bark burning, and gas fired boilers. Two 10,000 kw turbo-generators will be installed.

Associated with J. E. Sirrine Company will be Celli-Flynn of McKeesport, Pennsylvania, for the preparation of the architectural treatment of the mill and the design of the facilities building; also Mr. Willie Saint-Laurent of Montreal, Canada, will assist as a consultant in respect to the wood handling.

Personnel Data

The immediate personnel of the Bowaters organization resident in the vicinity of the site and who will supervise operations are: K. O. Elderkin, General Manager; V. J. Sutton, Mill Manager and Assistant to the General Manager; C. E. Opdyke, Comptroller and Treasurer; D. W. Timmis, Secretary and Assistant Treasurer; A. W. Bentley, Woodlands Consultant; George R. Koons, Manager of Industrial Relations; R. B. Reid, Purchasing Agent; and M. J. Osborne, Electrical Engineer.

The officers of the company are: Sir Eric V. Bowaters, President; A. B. Meyer, Vice-President; K. O. Elderkin, Vice-President; C. E. Opdyke, Comptroller and Treasurer; D. W. Timmis, Secretary and Assistant Treasurer.

A coming issue of SOUTHERN POWER AND INDUSTRY will give details on engineering features of general interest to industrial engineers in the South and Southwest.

Duafuel Engine Cuts Fuel Cost

ONE 1200 hp Nordberg Duafuel engine in the Commerce, Texas, municipal power plant is producing electric power for a total fuel cost of 2.70 mills. This represents a reduction of more than 72 per cent in fuel costs, a savings of more than $11,000 in the first six months of Duafuel operation.

The city first constructed a municipal power plant in 1929. Three Diesel engines with a total of 660 hp supplied the early power needs. In 1939, a 300 hp Diesel was added to the plant and in 1947 a 575 hp Diesel was installed.

To provide the additional capacity required and at the same time to take maximum advantage of available low cost natural gas it was decided to purchase a Duafuel engine large enough to carry the bulk of the load. Implementing this decision, the city installed in April, 1951, a Model FSG-138-SC Nordberg supercharged Duafuel engine. This eight cylinder unit has a 13" bore and 16½" stroke and develops its rated 1200 hp at 450 rpm. The engine operates on natural gas with a small quantity of pilot oil to initiate combustion.

The new engine quickly demonstrated its value to the plant after going into full service in May, 1951. After the first two months, the unit really hit its stride and was in operation 95 per cent of the time, producing a comparable percentage of plant output. This heavy schedule inevitably meant many hours of operation with light, unfavorable loads. Average operating load factor for the engine was only 50 per cent. Yet, it proved highly profitable to run the Duafuel engine even at relatively inefficient load levels rather than use the oil-burning engines.

During the six months under consideration, the entire plant used 55,289 gallons of fuel oil and 9,439,000 cubic feet of natural gas at a total cost of $8,510.40. Fuel costs for the same number of kwh at the consumption rate prior to installation of the Duafuel would have been $19,686.00—a saving of $11,175.60.

9 NEW FANS
IN EMERSON-ELECTRIC'S
CATALOG FOR '53!
EMERSON-ELECTRIC FANS for 1953
5-Year
factory to user
Guarantee
NEW TYPES!
NEW FINISHES!
Here's the catalog you've been waiting for... Emerson-Electric's 1953 catalog showing the most complete line of fans in America! You'll find new types... with new features that will make these fans preferred in offices, stores, institutions, hospitals, hotels and factories. Be sure to get your free copy. Just write for Catalog No. T112.
THE EMERSON ELECTRIC MFG. CO.
St. Louis 21, Mo.
AIR CIRCULATORS — Move a huge volume of air quietly and efficiently. Your choice of two sizes, 24" or 30" blades. Two-speed motor, 5-Year Guarantee.
BELT-DRIVE EXHAUST FANS
Long-life, slow-speed models in 24-, 30-, 42- and 48-inch sizes, exhausting up to 19, 350 C.F.M.
DIRECT-DRIVE EXHAUST FANS
Five top-quality models, blade sizes 12 to 30 inches. Fully-enclosed motors, quiet overlapping blades
EMERSON ELECTRIC
FANS • MOTORS
APPLIANCES

HELPING the *MAN-IN-THE-PLANT*

ideas . . . tools . . . methods . . . devices

Low-Cost System Can Heat Office

PLANTS operating on steam pressures of 100 lb or more can use the steam to heat offices and other areas and can do so more economically by using a system that does not require pressure-reducing valves.

The thermostatically controlled system requires only three components. This is not unusual, except for the fact that there's no pressure-reducing valve involved. The three components are: a low-voltage room thermostat, a low-voltage Pressuretrol unit (0-15 psi), and a one-half inch low-voltage spring-return Modutrol motorized valve.

They are installed in this way: Connect the steam line, through the Modutrol motorized valve, to the present heating system. Then install the Pressuretrol unit, tapping it into the line anywhere downstream from the valve. Wire the thermostat in series through the Pressuretrol unit and motorized valve, and set the Pressuretrol unit for two psi.

When the thermostat calls for heat it closes the contacts in the circuit to energize the Pressuretrol and the motorized valve; the motorized valve opens at the command of the Pressuretrol and maintains two psi steam through the radiator lines. As the demand for heat is satisfied, the thermostat breaks the circuit and the motorized valve returns to its closed position; it will remain closed until there is another demand for heat, when the process repeats.

Carl E. Wigner, chief engineer of the Borden Company's Chestnut Street branch in Chicago, is the author of this idea. He explained his thermostatically controlled system in a recent letter to Industrial Control News, external "idea" publication of the Industrial Division of Minneapolis-Honeywell in Philadelphia. It was explained that the system can be installed inexpensively and can be maintained at low cost.

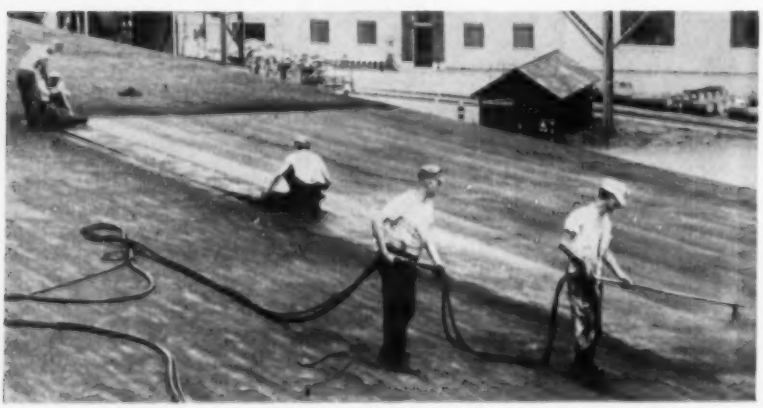
Asphalt Roof Maintenance Technique

A NEW heavy duty weather-tight surface for old or worn asphalt roofs, developed by Owens-Corning Fiberglas Corporation, is a combination of non-rotting Fiberglas Corotop roofing mat and specially processed Fiberglas Corotop liquid asphalt. It can be applied cold by brush or spray.

Application is simplified. The mat, available in rolls, is light weight and easy to handle. A four man crew can lay as much as 40,000 sq ft of Corotop a day. Using two-ply roof with hot mopping, the same crew could apply about 8,000 sq ft a day. This means a considerable savings in labor.

If application is done by the spray method, only necessary materials and equipment are an air compressor, with hose and spray gun; the liquid asphalt and Fiberglas roofing mat; large roofing brush and simple roofing tools. If by brush, materials and equipment are the same, except that the air compressor and spray equipment are not required.

Corotop is laid cold. There is no need for heating equipment, eliminating on-the-job fire hazards. It will adhere to damp or dry, flat or vertical surfaces and will cling as tightly to brick, masonry, metal or wood as it does to composition roofing.



Applicational Steps

A three step process follows minimum cleaning and patching of the old roof.

1—Apply by spray or by mopping a strip of Corotop liquid asphalt, over which the Fiberglas roofing mat is laid or rolled. Mat is imbedded in the asphalt by smoothing with a brush.

2—Cover the mat with a second coat of liquid asphalt which again is smoothed by brush, then allowed to dry at least 12 hours.

3—Following this drying period, coat the entire roof surface with a final coat of liquid asphalt.

User Reports

ARMSTRONG "UNIT TRAPPING"

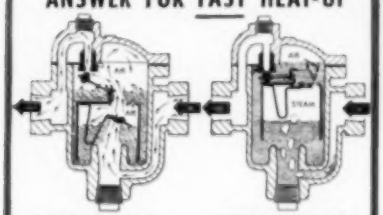
cut his fuel bill

20%

and speeded heat-up

15%

"BLAST" TRAPS PROVE TO BE ANSWER FOR FAST HEAT-UP



THERMIC OPEN THERMIC CLOSED

Where steam is turned on and off periodically, blast traps give really fast heat-up, provided accumulated air and condensate is pocketed and will be pushed out ahead of incoming steam. A large auxiliary thermic vent in the bucket opens when the trap is cold, letting air whistle right through trap. When trap reaches 210°F the thermic vent closes and trap operates as a standard trap (see drawings above). Blast traps are ideal for single pipe coils, small on-and-off unit heaters, on-and-off multiple coils, drip points, etc. See page 39 of The Steam Trap Book.

Experience of Greenhouse Owner Points Way to Greater Efficiency in Any Plant . . .

THE problem of operating steam heated equipment efficiently is basically the same whether you operate a greenhouse, a refinery or a food processing plant. That is why the experience of Reiss' Greenhouses, Minneapolis, should prove of interest and value to you.

By replacing old, inefficient steam traps on heating piping with an individual Armstrong "blast" trap on each coil, Reiss' cut its fuel bill exactly 20% and speeded-up heating of cold coils by 15%.

This benefit was gained solely because Armstrong traps drain condensate and air from steam heated units as fast as it accumulates and without leaking steam. In Reiss' case the "blast" traps described at the left were particularly beneficial, and may be in your case. For complete information call your local Armstrong Representative, or write:

ARMSTRONG MACHINE WORKS
806 Maple Street, Three Rivers, Michigan

You Get More Out of Your Fuel When You Use Armstrong "Unit Trapping"

SEND FOR YOUR FREE COPY OF THE 44-PAGE ARMSTRONG STEAM TRAP BOOK!

Complete data on selection of traps for all types of equipment plus installation and maintenance recommendations, trap list prices and physical data.

JUST CLIP THIS TO YOUR COMPANY LETTERHEAD AND MAIL:

ARMSTRONG MACHINE WORKS
806 Maple Street, Three Rivers, Michigan

Please send me The Steam Trap Book.

Name _____

Title _____

Comments on Bearing Selection

A DECISION to use ball bearings on every application simply because they run more easily than other bearings might be wrong. For greatest economy, shafts that are used only occasionally should usually be run in plain bearings.

On the other hand if the power is turned on frequently, even though not continuously, ball or roller bearings may be preferable to plain bearings because the starting friction of plain bearings is considerably higher than ball or roller types. Smaller motors of today are usually equipped with bearings of the anti-friction type to reduce starting torque.

Where plain bearings can be kept in good condition at all times the cost of the friction loss as compared with that of ball or roller bearings is often a very small item and may as well be neglected. For example, the friction cost of running the main bearings of an engine, generator, turbine pump, and similar large units is ordinarily very small as compared with the cost of the total power involved, whereas the difference in cost between ball bearings and plain bearings may be high. Under such circumstances, plain bearings may be more economical even though slightly less efficient.

Where lubrication may be comparatively more difficult (as on line shafting) and where the difference in friction may be considerable and hence the cost of power considerably less with ball or roller bearings, it is advisable to use a low friction type. An important advantage possessed by roller and ball bearings is that they require less lubricant than the plain type and needn't be oiled so frequently.

Method of lubricating is also a factor. If the value of the installation is such that a modern system of central oiling can be utilized, the plain bearings may prove to be more economical in the end.

Selection Aids

Before deciding one way or the other, one should answer these questions: (A) What will be the total first cost with ball or roller bearings? (B) What will be the total first cost with plain bearings? (Note: These first costs should include the extra cost of electric motors, generators, shafting, bearings, and everything else affected by the power requirements of roller, ball, or plain bearings.) (C) Subtract (B) from (A). (D) Decide on a percentage to charge against the difference in cost. Thirty per cent is considered reasonable by some engineers, but the percentage varies with the times, life of equipment, etc. This percentage should be earned annually, by the saving in cost of power and lubricants. (E) If the required percentage can be saved it will pay to install ball or roller bearings.

Certain types of roller and ball bearings provide for continuous lubrication over long periods of time, and important advances have been made in the method of sealing the lubricant into the housing. The maintenance cost of anti-friction bearings of this type is greatly reduced both because of the smaller amount of labor involved and because of the great saving in the amount of the lubricant itself.

In the event plain bearings are now in use and it is contemplated to replace them with the ball or roller type, the cost of labor in making the change must of course be included in the total first cost of anti-friction bearings. And since the common bearings being replaced are not likely to have much salvage value, the total price of the new bearings must be charged to the investment.

It is obvious that the possible net savings creditable to ball or roller bearings are considerably greater on a new installation than in a case where sleeve bearings, already installed, are to be replaced.

Support for Tank Painting

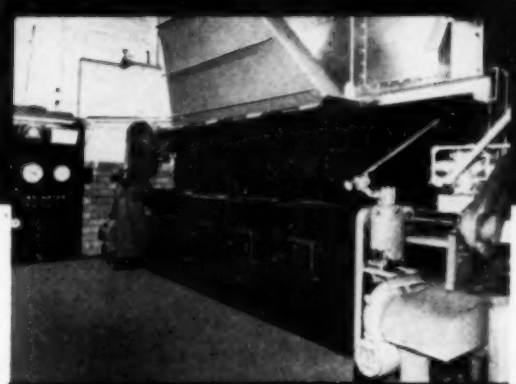
BY WELDING a one inch bolt to the top of the vent cap centered on the water tank, and putting a sleeve over the bolt, the plant engineer had an anchor for a swivelled arm which, rolling on a pair of rubber-tired rollers near the edge of the cone tank top, provided support for the "bo's'n's chair" in which the tank painter was supported.

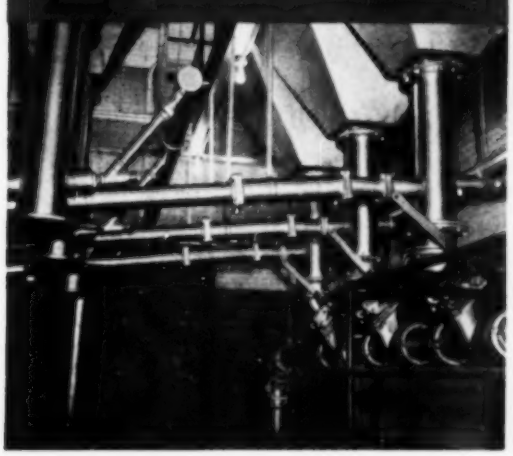
As the rubber tires on the roller-bearing wheels support the unit, the painter has no difficulty in "walking" around the tank and the rollers do not mar or chip the paint on the sloping roof. After painting, the support is normally taken down and stored. However, a satisfactory anchor for the outer end could be made if it is desired to leave the device in place.—*Elton Sterrett, Houston, Texas.*

Motor Protection

SOON after installation of new dye equipment at Roanoke Mills No. 1, in Roanoke Rapids, N. C., the plant began experiencing

Nash Motors SELECTS
DETROIT ROTOGRATE STOKERS





Nash Motors, Division of Nash-Kelvinator Corporation purchased two 100,000 pound per hour RotoGrate Stokers for their Kenosha plant. Boilers are Babcock and Wilcox 4 drum Stirling with superheaters and economizers. A similar stoker unit was purchased for the Nash Milwaukee plant.

Detroit RotoGrate is an improved spreader stoker. Grates move slowly forward to discharge the ash at the front. Coal feed, grate speed and air supply are synchronized at all capacities. A wide range of Bituminous Coal or Lignite may be burned. Controlled high turbulence and rugged, dependable cinder reinjection system contribute to fuel economy. Grates are of unique design which permits more burning capacity per square foot.

Write for RotoGrate Bulletin.

DETROIT STOKER COMPANY

GENERAL MOTORS BLDG., DETROIT 2, MICH.

District Offices in Principal Cities · Works in Monroe, Mich.

frequent failures of the 30 hp motors driving the stainless steel dye circulating pumps. These motors were splash proof in design, and the basement in which they were located was well ventilated. In spite of this, the defective motor windings showed considerable traces of acid deposits when checked with litmus paper. The various types of motor insulations tried would not resist the acids found on the windings.

Considerable snooping around by *S. S. Smith*, master mechanic, spotted the trouble. He noticed that as the pump packings on the coupling side failed, a fine spray of dye liquid was forced out at 60 psi. This spray invariably struck the motor at the ventilating air intake openings, thus quickly saturating the interior of the motor.

To eliminate this trouble, a splash plate was installed between each pump and its driving motor similar to the standard installation made on Underwriter's Fire Pumps. Motor failures immediately dropped to less than ¼ of those previously experienced.—*Robert J. Tucker, Jr., Plant Engineer.*

Bottleneck in the Accounting Department

FOR their extensive electrical contracting operations in six states, as well as their transformer winding plants and retail appliance stores, the Fagan Electric Company, Inc., of Little Rock, Arkansas, maintains a central accounting system.

The problem had been to eliminate the time consumed by their accounting machine operator in searching for ledger cards for their accounts receivable and payable. More time was needed to find the card than in the actual posting. They eliminated this non-productive work by the use of VISIrecord, visible vertical record keeping equipment. Utilizing three VISIrecord units, the "search" time for ledger cards, which formerly caused the delays, was practically eliminated.

Each card housed in the VISIrecord tray has a visible, vertical, and diagonal margin. The records are filed in rows with the visible margin of each card exposed. The operator looks at the bank of cards, picks out the record she needs, by glancing at the visible margin, and then places the card in the machine and posts. The cards are punched at the bottom to fit over rods running along the bottom of the equipment. The rods keep the records in perfect alignment. Because the records are not secured to the equipment, removal and replacement is simple.

Overall indexing is accomplished by the use of dividers, which separate the banks of cards. Index tabs are secured to plastic strips that run across the tops of the dividers. The indexing for the entire record is seen at a glance by the operator. She merely flips the indexed divider, picks the record, posts it in the machine, and returns it to the file—the entire operation—a matter of seconds.

Long Acceleration

By R. E. Parker
General Electric Co.
Schenectady, N. Y.

LONG ACCELERATION may be accomplished in any of the following ways:

1. Additional flywheel effect
2. Less motor torque on starting
3. More load torque on starting
4. Two step starting systems
5. On-off (jog) starting

Of these methods, the two step starting is the safe one, and is the one to be selected if possible. It may be accomplished in any of five ways:

1. Resistance starters
2. Partial winding
3. Reactors
4. Autotransformers
5. Two speed motors

The last three of these are the more expensive.

Jogging instead of two step starting is practical for some applications but it is rough on starters.

Cost must be balanced against the merits of the starting scheme selected. The table below gives a relative price picture for some commonly employed starting means.

Standard Motor	1.0
Jog	1.05
Dual Rating Motor	1.2
2-Step Starting	1.5 -2.0

Selection is a question of "How little is good enough."

Adapted from comments presented at the Piedmont-Carolina Electrical Equipment Conference. For additional equipment discussions check pages 42-44, SP&I for January, 1953.

3 POWERS Safety Features

Banish "Booby Trap Showers" In Kansas City's Famous

Hotel Muehlebach

ADDITION

Architects
NEVILLE, SHARP & SIMON
Mechanical Engineer
WILLIAM L. CASSELL
Contractors
U. S. ENGINEERING CO.

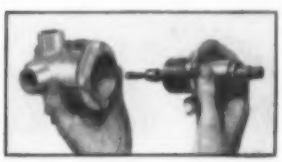
(A) POWERS Thermostatic WATER MIXER

(B) Diverter Spout

POWERS Thermostatic Water Mixer

Greater Comfort and Safety assured by these 3 features

1. Powers mixers prevent delivery to shower or tub above 115° F.
2. Temperature remains *constant* wherever set regardless of **pressure** or **temperature** changes in water supply lines.
3. Failure of cold water supply instantly and completely shuts off delivery to shower or tub.



One Moving Part
Easily Accessible from the Front
Easy removal of Thermostatic Motor and Valve Assembly makes it possible to inspect, clean or flush out mixer if necessary. No special tools required. Simple, durable construction insures long life and minimum of maintenance.

★

Only ONE Shower or Tub Accident May Cost Many Times More Than POWERS Mixers

The Most COMFORTABLE Showers Are Regulated by

POWERS

Thermostatic WATER MIXERS

Shower and tub combinations, because they are sometimes used by children and oldsters, require the best protection against scalding and unexpected temperature changes. Subject a Powers mixer to any test you wish. You'll find it the safest made for hotels, schools, hospitals and clubs.

How it Works: Hot and cold water piped to mixer are blended and thermostatically controlled at any temperature desired. For shower or tub bath, Powers mixer handle is turned until water flowing into tub reaches temperature desired. Then bather enters tub. For a shower, diverter spout knob is pulled up diverting water to shower head. When shower is completed, mixer is shut off. Diverter spout flapper valve returns to "tub" position automatically.

To be Really Sure of Safe Showers • Specify POWERS

(497)

Established in 1891 • THE POWERS REGULATOR COMPANY • SKOKIE, ILL. • Offices in Over 50 Cities
1333 Spring St., Atlanta, Ga. 101 N. Elm St., Greensboro, N. C.

%Proportioneers% "Yankee Clipper"

The much publicized "Yankee Clipper" of %Proportioneers, Inc.%, manufacturer of chemical feeding and proportioning equipment, is now visiting industrial centers of the Southwest. Working exhibits of %Proportioneers% products are installed in a 40 ft motor trailer.

Following a stop in Amarillo, Texas, the trailer moved into Dallas, Texas, for the first two weeks of January. New Orleans and Nashville are included in the current tentative schedule. Equipment displayed ranges from the company's smallest unit for chlorinating domestic water supplies to large proportioning pumps for industry.

Electronic Air Cleaners for Guided Missile Plant at Bristol, Tennessee

OVER one and a half million cu ft of air/minute will be cleaned electronically at the new Sperry-Farragut plant in Bristol, Tennessee, by 18 Trion electronic air cleaners like the one illustrated above.

The elimination of dirt and dust particles from the air as small as 1/250,000th of an inch in diameter is necessary in the production of delicate precision equipment at this plant.

Trion equipment operates on the principle of magnetic attraction. All particles of dirt and dust receive a high voltage positive charge and are collected on charged plates of opposite polarity. At periodic intervals the collected dirt and dust is washed from the plates to a sewer by a system of built-in jet sprays of water. Electronic air cleaners have the highest rated efficiency of any type of air cleaning equipment.

Trion electronic air cleaners are manufactured by Trion, Inc., of McKees Rocks, Pa. An illustrated case history, featuring equipment installed at the Gastonia Combed Yarn Corporation of Gastonia, North Carolina, was featured on pages 100-101, SP&I for October, 1951.

Brazing Aluminum Window Frames

"BETTER Because it's Brazed" might well be the slogan of Aluminum Products Company, Houston, Texas, manufacturers of double-hung windows marketed under the name "APCO." Their windows are fabricated of 63S-T5 extruded aluminum.

Original designs called for mechanical joints at the corners, which proved to be excessive in cost and not satisfactory. With the help of The Smithweld Company, Houston, associate of Big 3 Welding Equipment Company, distributor for All-State Alloys and Fluxes, they redesigned the windows, substituting brazing for the mechanical joints.

Key to the success of the redesign was the adoption of All-State No. 31 Sheet Aluminum Brazing Rod and No. 31 Brazaloy Flux for all brazed joints. Reason for selecting this rod and flux was that the low working temperature (1050 F) permits the operation to be performed without danger of burn-throughs. The Brazaloy flux gives an exact indication when the joint is ready for application of the rod. It changes its form and appearance at the exact instant when the brazing should be done.

Print Machine

WHEN the Virginia State Highway Department undertook the program now "in the works,"

ALL FORGED STEEL

Edward
CHECK VALVES

for freedom from vibration, clatter and piping shock

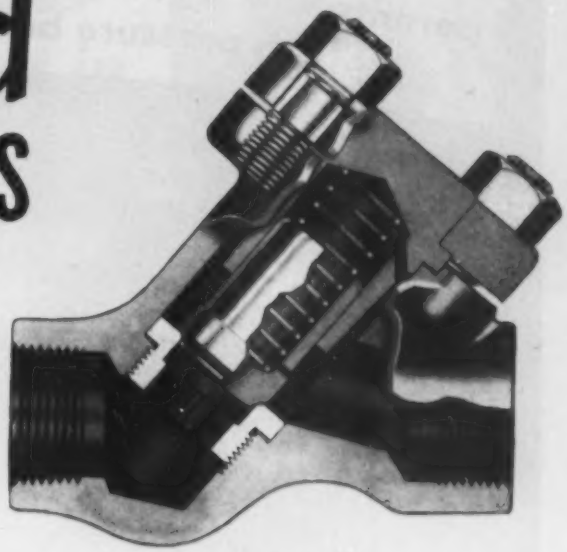


FIG. 4638,5538

For all piping systems requiring small check valves, Edward furnishes a complete line of forged steel valves in both principal check valve types:

PISTON TYPE CHECK VALVES for extra advantage in lines where it is important that the disk closes tightly upon the seat. Careful design of internal parts gives full flow area, low head loss, avoids excessive shock. Exclusive disk guide lip and spring loading for quick positive seating. Available with stellite contact faces on seat and disk on special order.

BALL CHECK VALVES are ideal where heavy viscous fluids are encountered. Bodies are of specially heat treated forged steel. The stainless steel ball of special EValloy high chromium stainless steel is guided by two steel ribs. A spring aids in seating the ball on the carefully lapped seat.

AVAILABLE IN WIDE RANGE OF SIZES AND STYLES

- √ 600, 1500 and 2500 lb sp pressure classes
- √ Horizontal or vertical types
- √ Screwed, flanged or socket welding ends
- √ Union, bolted or welded bonnet
- √ Ball or piston type disk
- √ In ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2" sizes

GET ALL THESE PLUS FEATURES:

- √ Extra strong and long spring of stainless steel for sure closing action
- √ Rated for 600 lb sp at 850F, 1500 lb sp at 850F and 2500 lb sp at 1000F
- √ Extra strong bodies of specially heat treated forged steel
- √ Cushioned closing action eliminates excessive vibration
- √ Fit any piping arrangement, vertical or horizontal
- √ Corrosion proof stainless steel seats and disks or balls
- √ Accessible removable seats
- √ Easy disassembly if needed
- √ Streamlined body contours for free flow, low pressure drop

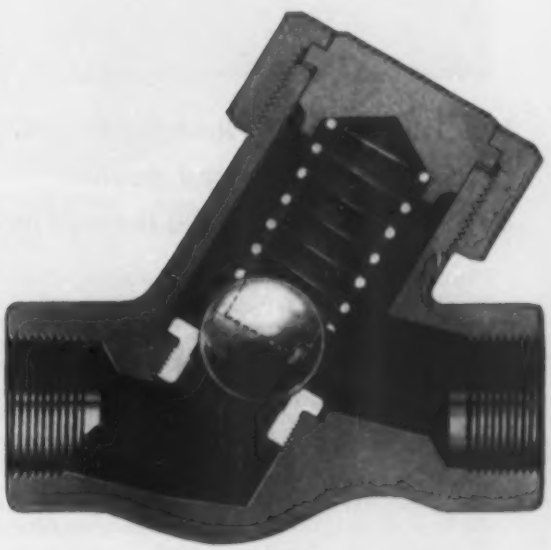


FIG. 2672,3572

In addition to forged steel check valves, Edward builds a complete line of larger cast steel check valves—there is an Edward valve for every check valve application. Write for complete information.

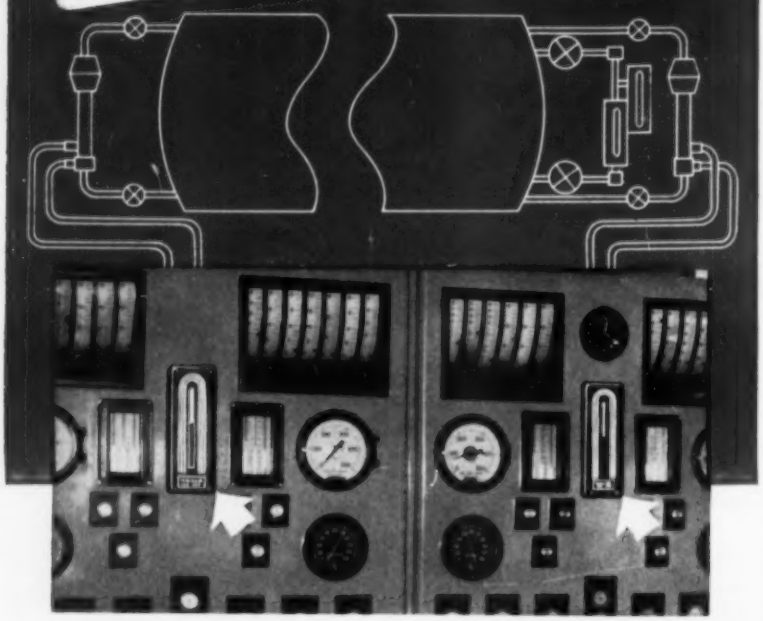
Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

122 West 144th Street, EAST CHICAGO, INDIANA

Another Product

Latest boiler code provision permits new water gage facility on high pressure boilers



Now two EYE-HYE Remote Gages give you the required double check on pressures 900 lbs and over

Two independent remote level indicators of the compensated manometric type may now be used instead of one of two gage glasses required on pressures 900 psi and over. You still must have one conventional type gage, maintained in serviceable condition, but it may be shut off while both remote indicators are in operation.

This is a tremendous advantage. It removes the need for checking high gages, maintaining mirrors or other water level reading methods. EYE-HYE's sharp, illuminated indication is frequently reported as more accurate than gages at the drum. Now the two gages required can be at eye height—convenient, safe—a true double check on the vital boiler water level.

For full details of the new code interpretation read Case No. 1155. For information about Reliance EYE-HYE, call your Reliance representative or write for Bulletin CO.

The Reliance Gauge Column Co. 5902 Carnegie Ave., Cleveland 3, Ohio

Reliance EYE-HYE
Remote Reading Gage
All-hydrostatic - Reads like a tubular glass gage

existing plans were already overcrowded with details. Additional sets of plans were needed to put the program into effect. And good reproductions from low-quality originals were also a necessity and permanence was a prime requirement.

To do the job as rapidly as possible by conventional drawing reproduction techniques would have taken more time than the state felt it had available for the purpose. Furthermore, it was doubted whether conventional reproduction techniques would result in plans of sufficient quality to meet specific needs without re-drawing.

As a result, it was decided to adopt a method of reproducing plans photographically. This would make possible direct-positive copies from original drawings and result in prints in all cases which would be of higher quality than the originals.

New Method

As a basic step for the solution of this problem, the Virginia State Highways blueprint section purchased automatic equipment suitable for both blueprinting and for processing photographic reproductions on the newest types of photographic paper.

The photographic paper used is roll-fed into the machine, exposed to a high intensity light source, and processed as it passed through tanks of photographic solutions. The operator simply places the original drawing on the photographic paper and the finished print, dried and ready for use, emerges from the machine in a matter of minutes.

Paper speed is constant, and exposure is adjusted by regulating the light source to yield top-quality reproductions from originals of varying contrast and line density. Good results are obtained not only from ink originals on cloth, but also from pencil drawings on either cloth or vellum.

The new paper also speeds changes in department drawings since once the photographic reproduction has been made, existing right-of-way lines may be removed with an eradicator and the new

lines drawn in with ink or pencil. Corrected prints may then be used as originals to produce additional prints as desired.

Courtesy Eastman Kodak Co.

Stampings Reduce Bracket Costs

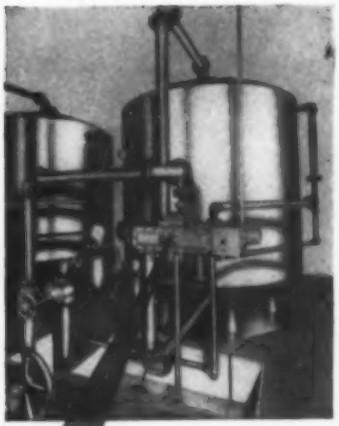
IT IS DIFFICULT for stampings to compete with unmachined castings unless the production is very large. However, in the case of support brackets required by Parks-Cramer Company of Charlotte, N. C., Worcester Pressed Steel Company was able to produce superior, less costly parts on presses than the castings previously used. The stamped hangers weigh 14 ounces each, whereas the castings weighed four pounds each.

As the brackets are used to support track for automatic traveling cleaners over cotton spinning machines, the lighter weight offers definite advantages. Installation is greatly simplified and there is no longer any danger of breakage if the brackets are dropped in transit or in use. A stiffening rib appears both in the stamping and the casting.

Production by stamping usually permits the elimination of excess stock without weakening pieces where strength is needed. On one style, this is accomplished through an added extruded, tapped hole, which, although adding substantially (twenty cents each) to the cost, has proved an economical way of providing thickness for tapping where needed. This central hole is $\frac{7}{8}$ in. deep x $1\frac{3}{8}$ in. in diameter, and drawing it requires several special operations, as metal crowding toward the hole diameter from the rest of the part must be considerably compressed and squeezed together. The special operations include a double-action operation, process annealing, two necking operations, overall trim, piercing and forming the center hole (a part of the depth comes from the hole periphery), and tapping. This hole would have cost even more if the irregular edge (about 1/16 in. variation) had had to be smoothed up and faced off.

PROCESSES FOR REMOVAL OF WATER IMPURITIES

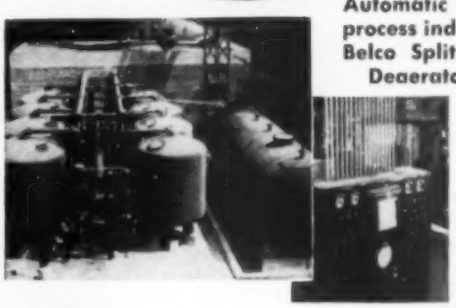
BELCO combines the best in design with automatic control



BELCO CAMOMATIC VALVE

The Belco Camomatic Valve replaces the seven individual valves required for normal softener operation. When instruments indicate, or when a predetermined amount of raw water has been used the softening cycle is set in operation, automatically. The Camomatic valve is easily adapted to pressure filtration and other process control. These valves are being used in some of the country's finest plants.

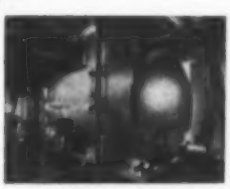
Automatic installation in large process industry. Panel controls Belco Split Stream Plant and Deaerator, automatically.



Belco has built the largest automatic silica removal demineralizer plant in the world. Your needs will be met with unmatched engineering knowledge and with equipment designed to do your job.

BELCO ATOMIZING VALVE

★ We invite your consultations regarding all water conditioning requirements. Get acquainted with our organization for authoritative assistance and close cooperation. Write for late descriptive bulletins.



BELCO HIGH PRESSURE STEAM DEAERATOR

Belco

Belco Industrial Equipment Division, Inc.

PATERSON 3, NEW JERSEY

NEWS

Rockwell Names Johnson, S.E.

ROCKWELL MANUFACTURING COMPANY, Pittsburgh, Pa., has announced the appointment of R. A. JOHNSON as ATLANTA District Sales Manager. Mr. Johnson will be responsible for the coordiation of all Meter and Valve Division sales in the Southeast. He will report directly to J. W. NORTHCUTT, the Regional Manager who is responsible for the territory from Virginia to Louisiana.

R. A. Johnson, Atlanta district sales manager of Rockwell Manufacturing Company.

Mr. Johnson joined Rockwell in 1939 and became a Sales Engineer in the Atlanta District, working in North Carolina and Virginia for over five years. In 1951, he was made Assistant Sales Manager of Liquefied Petroleum Gas Products and held that position until his recent appointment.

General Electric—Southeast

The appointment of J. A. STOLLMAN as district representative for GENERAL ELECTRIC'S Construction Materials Southeastern district has been announced.

National Carbide—Kentucky

NATIONAL CARBIDE COMPANY, a division of Air Reduction Company, Inc., has announced the appointment of C. E. MCKIM as works manager of its new Calvert City plant.

Mr. McKim joined National Carbide at its Keokuk plant in 1929, and was transferred to the Louisville plant in 1941 to take charge of crushing and packing operations. He subsequently became director of maintenance, plant superintendent, and works manager.

ASTOR BROWN, who has been with the company more than ten years, succeeds Mr. McKim as works manager at Louisville.

Allis-Chalmers Names Cline Charlotte District Manager

ROLAND H. CLINE has been appointed manager of the CHARLOTTE, N. C., district office of ALLIS-CHALMERS General Machinery Division.

Roland H. Cline is now manager of Charlotte, N. C., office of Allis-Chalmers.

Cline, who succeeds the late William Parker, has been a representative in the Charlotte office since September, 1949. He joined Allis-Chalmers in 1946 and was a representative in the Atlanta district office before being assigned to Charlotte.

A native of Arcadia, Florida, he is a graduate electrical engineer of Duke University.

Belco Names Stoy and Kipp

MR. JOSEPH STOY, project engineer with BELCO INDUSTRIAL EQUIPMENT DIVISION, INC., for the past three years, has been appointed branch manager of Belco's new TEXAS offices, located at 2009 Fannin Street, Houston.

Mr. Stoy will handle all phases of water treatment. He is a graduate of Washington University, holding a degree of B.S. in chemical engineering.

HAPGOOD KIPP has been appointed District Manager of the company's Philadelphia office, Commercial Trust Bldg., Philadelphia 2, Pa. For the past twelve years Mr. Kipp has been Chief Engineer for the American Water Softener Company.

Westinghouse—Mississippi

Construction has been started on the WESTINGHOUSE ELECTRIC CORPORATION'S lighting fixture plant in VICKSBURG, MISS.

The plant will be devoted exclusively to the manufacture of fluorescent lighting fixtures for commercial and industrial use, and industrial incandescent lighting fixtures. Plans call for a one-story steel and brick structure running 900 ft along U. S. Route 61, and adjacent to the municipal airport six miles south of Vicksburg.

Completion of the plant, which is part of a 296 million dollar expansion program, is scheduled for October, 1953. Employment of from 500 to 800, with an annual payroll of approximately two million dollars, is expected when the plant is in full operation.

Oakite Presents Awards to Southern Representatives

L. T. PRINCE, Greensboro, N. C., technical service representative of OAKITE PRODUCTS, INC., manufacturers of industrial cleaning and allied materials, received the D. C. Ball award for distinguished service to industry at a technical sales conference held recently at the Sheraton Hotel, ST. LOUIS. Presentation of the award, in the form of a bronze plaque, is made annually to the member of the firm's nationwide field organization adjudged to have rendered the most outstanding service to industry during the year. It is given in memory of DAVID CLIFTON BALL, founder of the company.

L. W. CUNNINGHAM, technical service representative in the SHREVEPORT, LOUISIANA area received a special scroll in connection with the company's Distinguished Service Award program, which calls for awards to be made annually to five members of the organization who have rendered especially notable service to industry during the year. Presentation of the scroll was made at a meeting of representatives in Hollywood, Calif. last November.

L. T. Prince of Greensboro, N. C. (right), receives Oakite Distinguished Service Award from *John A. Carter,* company president, at St. Louis meeting.

news (continued)

H. K. Porter Merger

DELTA-STAR ELECTRIC COMPANY has been merged into the parent company, H. K. PORTER COMPANY, INC., and will operate as Delta-Star Electric Division.

Policies, management and operation of the new division will remain the same, with C. S. BEATTIE continuing as General Manager.

Cleco Distributor—El Paso

THE CLECO DIVISION of the REED ROLLER BIT COMPANY, Houston, Texas, has announced the appointment of PONSFORD EQUIPMENT COMPANY, 408 Bassett Tower, EL PASO, TEXAS, as distributors for Cleco products in their area.

Cleco manufactures the Cleco and Dallett lines of air tools and accessories—including tools for construction, manufacturing, metal fabrication, foundries, industrial maintenance and stone carving.

Vepco Expansion

A newly-completed electric generating unit with a capability of 110,000 kw went into commercial operation recently at the VIRGINIA ELECTRIC AND POWER COMPANY'S Chesterfield power station.

Constructed at a cost of nearly $15,000,000, the unit is the third in operation at the station and brings the total capability there to 250,000 kw, enough to supply the full requirements of a city twice the size of Richmond.

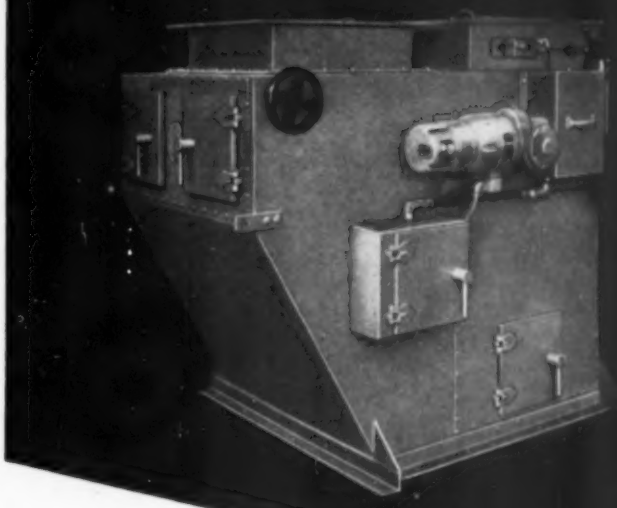
Situated on the James River a few miles below Richmond, the Chesterfield station is now the largest in the Vepco system. The first unit of the station was completed in 1944 with a second unit being added five years later. The new unit has the only large forced control circulation boiler in operation in the Southeast.

Vepco now has another generating station under construction at Portsmouth with the first 110,000 kw capability unit scheduled for service in early 1953. A second unit of equal size for the Portsmouth station is expected to be completed during the late summer of 1954.

In addition, construction of a 91,000 kw hydro station on the Roanoke River near Roanoke Rapids, N. C. is awaiting a decision from the United States Supreme Court and application has been made to the Federal Power Commission for a license to construct an 87,000 kw station a few miles upstream at Gaston, N. C.

NEW Richardson

H-39 COAL SCALE



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2. *All* wiring and controls outside coal chamber.
3. Beam-ratio test facilities *completely outside* coal chamber.
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6. Construction of access doors makes it *impossible* for coal dust to spill out on floor when opening.
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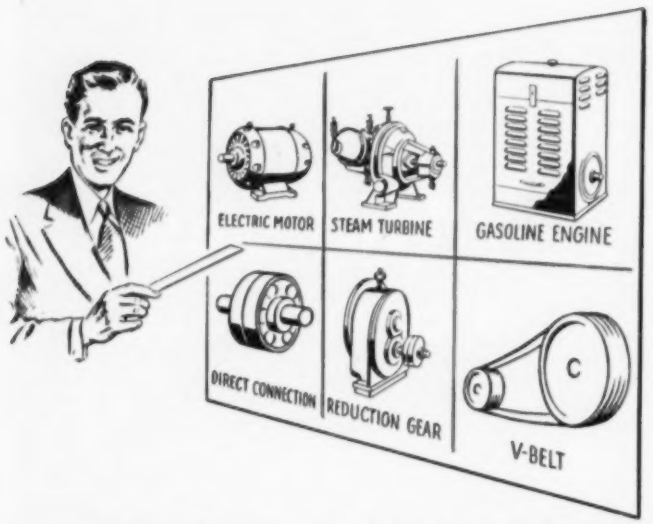
Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

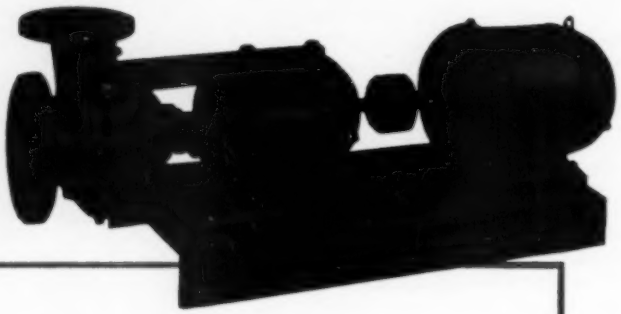
8616



Pick out ANY PRIME MOVER or ANY DRIVE

You'll find the RIGHT COMBINATION for your liquid-moving job in the complete line of I-R CRADLE-MOUNTED PUMPS

They are available in capacities from 5 to 2400 gpm with heads to 500 ft. No matter how "special" your requirements may be, you can get exactly what you want from this standard but superior line of Ingersoll-Rand pumps.



You get all these other advantages, too

Economy of Operation. These pumps are designed to maintain their original high efficiency year after year—making substantial long range savings in your power bills.

Low Maintenance. The driver can be removed or replaced without disturbing the suction or discharge connections to the pump. And the pump itself is easy to get at—with plenty of room to inspect and renew the packing.

Extra Dependability. Careful selection of all materials and extra precision in every step of manufacture mean longer, trouble-free service, even on the toughest jobs.

Quick Delivery. By maintaining large stocks of all standard parts used in the Cradle-Mounted Pump line, Ingersoll-Rand is able to make unusually prompt shipments.

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y. 778-9

Your nearest I-R representative will be glad to give you further details and help you select the pump that's best suited to your requirements.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

Pioneer Rubber—Dallas

FRED B. GETTEN has been appointed manager of the DALLAS, TEXAS branch of PIONEER RUBBER MILLS.

Mr. Getten, a graduate of Case Institute of Technology, has been active in the industrial rubber field for the past eighteen years, where he has specialized in product development research, engineering sales, and similar technical work. Pioneer Rubber Mills manufactures a complete line of belting hose, moulded goods, fire hose, and similar industrial rubber goods.

Mr. Getten's headquarters will be at the company's office and warehouses at 1205 Levee Street, Dallas 2, Texas.

Tenn-Tex—Houston

Formal opening of TENN-TEX ALLOY AND CHEMICAL CORPORATION'S new plant has added to HOUSTON'S varied line-up of industries a producer of ferromanganese and other alloys used in the manufacture of steel. The plant will produce some 2500 tons of these alloys per month, most of which will be supplied to the nearby plant of the Sheffield Steel Corporation.

W. A. DILLARD, formerly of Chattanooga, Tenn., has been named plant superintendent in charge of operations, W. B. KELLY, assistant superintendent, and ALLEN WOODS, chief clerk.

FUTURE EVENTS
Of Engineering Interest

UNITED STATES DEPARTMENT OF COMMERCE, Merrill C. Lofton, Regional Director, 716 Forsyth Bldg., Forsyth & Luckie Sts., NW, Atlanta 3, Ga.

Feb. 11-13, Technological Display, New Exhibit Hall, Atlanta Biltmore Hotel, Atlanta, Ga.

NATURAL GASOLINE ASSOCIATION OF AMERICA, Wm. F. Lowe, Sec'y, 422 Kennedy Bldg., Tulsa 3, Okla.

Feb. 27, Regional Meeting, Scharbauer Hotel, Midland, Texas

April 29-May 1, 32nd Annual Convention, Rice Hotel, Houston, Texas

SOUTHERN SAFETY CONFERENCE, W. L. Groth, Exec. Dir., Box 8927, Richmond 25, Va.

Mar. 1-3, 14th Annual Southern Safety Conference & Exposition, Atlanta Biltmore, Atlanta, Ga.

MATERIALS HANDLING SHOW, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

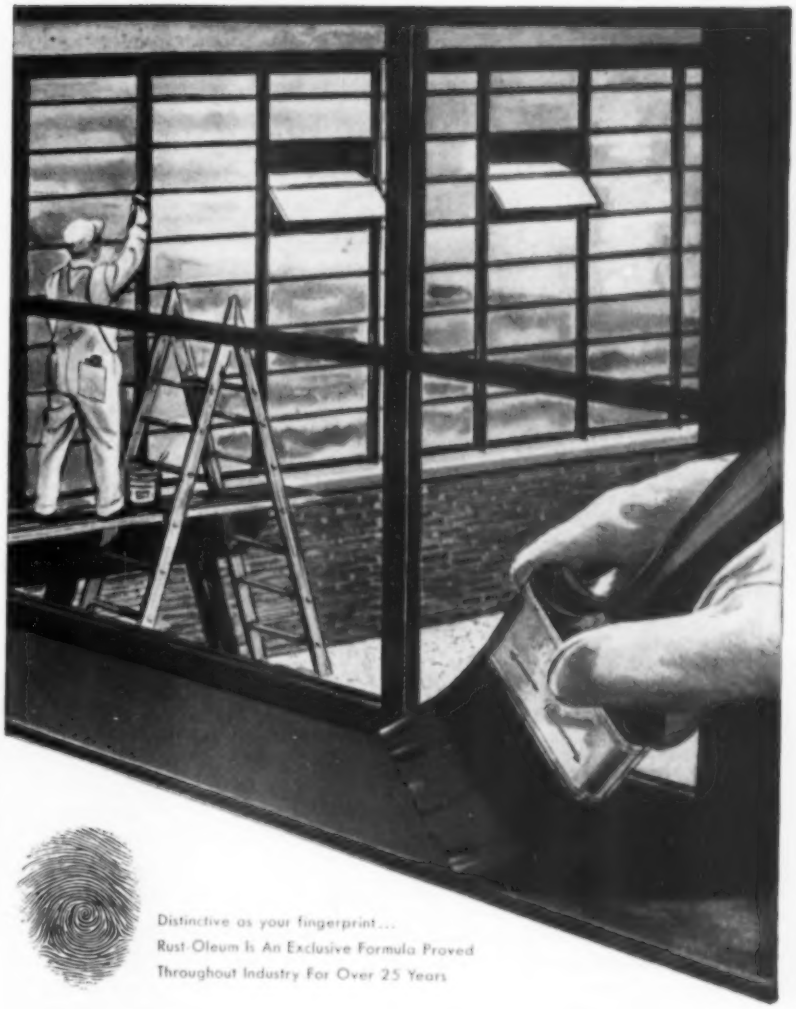
May 18-22, Fifth National Materials Handling Exposition and Conference, Convention Hall, Philadelphia, Pa.

EXPOSITION OF BASIC MATERIALS FOR INDUSTRY, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

June 15-19, Exposition and Conference, Grand Central Palace, New York 17, N. Y.

AMERICAN WELDING SOCIETY, National Secretary, 33 West 39th St., New York 18, N. Y.

June 16-19, National Spring Technical Meeting with Welding and Allied Industry Exposition, Shamrock Hotel and Hall of Exhibits, Houston, Texas.



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For Cups — Ball Bearings — Water Pumps — Universal Joints. Waterproof — Exceptionally high melting point. Soft enough for gun application.

ALBANY GREASE

A cooling lubricant for operating temperatures from 110° F to 200° F.

ALBANY PRESSUREGREASE

A superior waterproof mineral oil grease of high viscosity. Comes in Liquid, Soft, Medium, Hard and Graphite Pressuregrease Soft and Medium.

ALBANY BEARING LUBRICANT

(Ball or Roller Bearing)
Will not separate or oxidize assuring long life to bearings. May be used in hand grease guns.

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Retards wear, quiets gears. Waterproof. Will not drip when gears are idle or in motion.

ALBANY PENETRATING OILS

(Clear or Graphite)
Quick-acting. Cuts rust as well as lubricates. Loosens sticky valves, eliminates squeaks.

ELECTRICAL DIVISION

Albany RBR Wire Pulling Compound

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J. A. MENGE CO.
932 Nat'l Bank of Commerce, New Orleans, La.

ADAM COOK'S SONS, Inc.
Mfrs. of Albany Lubricating Products
LINDEN, NEW JERSEY

Hudson-Rush Co. to Serve Southwestern Industry

MORLEY A. HUDSON and JACK W. RUSH have formed a manufacturers representative organization, HUDSON-RUSH COMPANY, with offices in SHREVEPORT and DALLAS. Hudson is a Georgia Tech graduate and has previously been with Allis-Chalmers and Magnolia Petroleum. Rush is a Vanderbilt-Oklahoma graduate and has been with Du Pont, Sunray and Calumet Refining. For the past 6 years both men were division managers with Eggelhof Engineers, Inc.

The firm will specialize in heat transfer equipment, controls for process industries, and auxiliaries for large engines. Covering the middle belt of the Southwest, their territory will be west, north and east TEXAS, north LOUISIANA, and ARKANSAS. Principals represented and products to be offered are: BARCO flexible and revolving joints, BROWN FINTUBE sectional heat exchangers and elements, CONOFLOW pneumatic operators and valves, CONTINENTAL butterfly valves, KRISTI Tennite II plastic tubing, MERCOID mercury switch equipped with automatic controls, and PECO oil filters.

Portable Demonstrator of GAI-Tronics Corporation

The GAI-TRONICS CORPORATION of Reading, Pa., specialists in the design and fabrication of effective communication systems for use in electric generating stations and industries where high noise levels make ordinary means of communication difficult and unsatisfactory, have already started on their 1953 series of demonstrations in the plants of several large utilities in Pennsylvania, Ohio and KENTUCKY.

This company, a subsidiary of Gilbert Associates, Inc., a foremost engineering firm, has developed a small edition of its system which makes possible a very realistic demonstration, under actual conditions in a prospect's plant. Actual performance of the system's features such as (1) the speed and sureness in locating plant personnel and/or giving instructions via special loudspeakers designed to effectively "cut through" high and difficult noise levels; (2) the ability to conduct two-way or group conversations over special telephone-type handsets, designed to work clearly and surely in extreme noise without the protection and operational undesirability of a sound-proof booth; and (3) the fact that the system is alerted for emergency use at all times, is effectively demonstrated under the most trying conditions.

Plans for the next series of demonstrations of the GAI-Tronics Power Plant Communication system are now being completed. Companies in several Southern states are listed in this series. Interested companies who have not made arrangements for a demonstration are urged to take advantage of the opportunity presented at this time, by contacting GAI-Tronics Corporation headquarters in Reading, Pa. A number of these systems have been installed in plants in the CAROLINAS, LOUISIANA, OKLAHOMA and TEXAS, where they are providing effective, dependable service.

GAI-Tronics Corporation is also engaged in the design and fabrication of special custom-built control equipment for use in electric generating stations and power plants.

Yale & Towne—Tennessee

The newly formed YALE LOCK AND HARDWARE DIVISION of THE YALE & TOWNE MANUFACTURING COMPANY, has announced the appointment of JOHN E. CHARLESON, plant manager at LENOIR CITY, TENNESSEE, where a new factory is now under construction.

Mr. Charleson will direct all operations at the plant with the exception of sales and advertising. The marketing of all Yale brand locks, hardware, and pumps, will be directed by the Sales staff of the central management group at Stamford.

Westinghouse Turbines and Generators—Texas, Okla.

Two 66,000 kw turbines and generators, scheduled for delivery late in 1953 and early 1954, have been ordered for generating stations of the PUBLIC SERVICE COMPANY OF OKLAHOMA and the TEXAS ELECTRIC SERVICE COMPANY.

WESTINGHOUSE ELECTRIC CORPORATION is building the generators at East Pittsburgh, Pa. The turbines are being built at the Westinghouse Sunnyvale, Calif., plant.

Jones & Laughlin—Tulsa

THE JONES & LAUGHLIN SUPPLY COMPANY, TULSA, OKLAHOMA, a wholly-owned subsidiary of JONES & LAUGHLIN STEEL CORPORATION, became a division of J&L on January 1, 1953.

Westinghouse—Ala.

WESTINGHOUSE ELECTRIC CORPORATION will build an ultra-modern plant for the manufacture of welding electrodes and brazing alloys near Montevallo, 38 miles south of BIRMINGHAM, ALA.

This will be the first welding electrode plant in the South. Its principal product, welding electrode, will supply all of the South and the Pacific Coast states, and the brazing alloys manufactured here will be shipped throughout the United States.

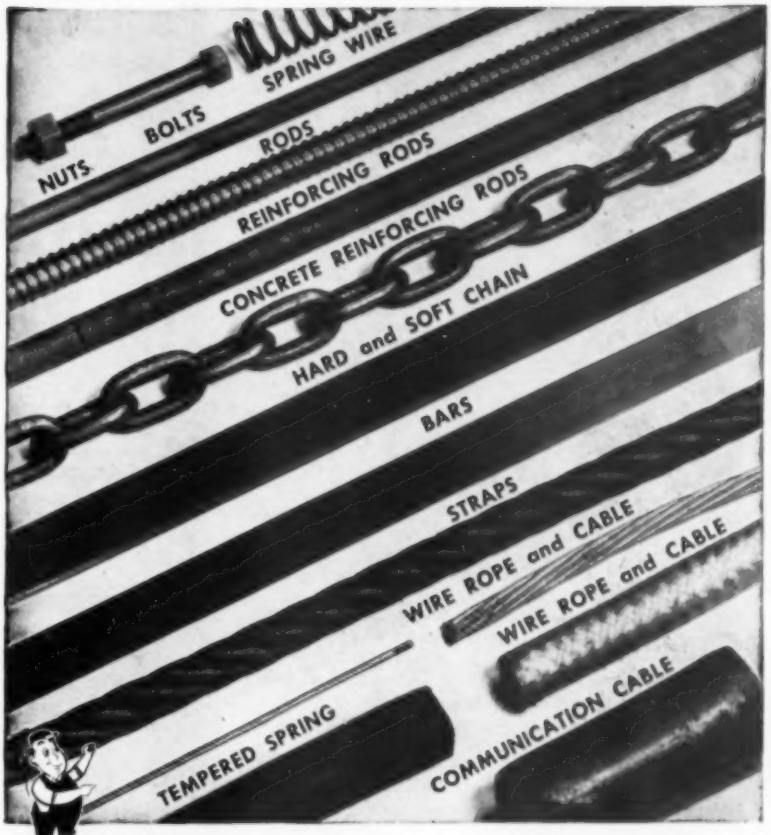
Plans call for a one-story steel and brick structure, running more than 400 ft along state route 25, and the most modern materials handling system available.

In addition to welding electrodes for normal industrial use, the plant will be equipped to produce some of the newest and latest types of electrodes that are being developed for Armed Forces' requirements.

It is hoped that construction will start in February, and the date set for completion is September 1953. If this schedule is met, full operation of the plant should be possible by early 1954.

RICHARD E. BALLENTINE has been appointed plant manager. Until completion of the project, he will continue in his present function as development engineer on brazing alloys for the Motor & Control Division.

Mr. Ballentine, who specialized in metallurgical studies at Carnegie Institute of Technology, was associated with the Otis Steel Corporation for six years before joining Westinghouse in 1940. He was promoted to his present position in 1946.



"If it's metal . . . I'll cut it"

You have one Porter Cutter "somewhere" in your plant—and you should have more—to do quick cutting jobs at less cost. Enough Porter Cutters in the right places—for maintenance, in machine shop, in receiving room, on service trucks—to save hundreds of dollars every year in labor cost, shutdown time and installation delays. Just look at the above picture—the types of metal a Porter cuts—and match this picture up with the cutting jobs in your plant—perhaps you need a dozen or more Porter Cutters—check up today—and equip to properly serve your cutting needs.

Porter Cutters are rugged tools—hand-powered, cutting up to ¾" bolts plus cutting rods, chain, wire, cable, strap, etc. Porter Cutters are two-hand powered—50 pounds pressure on the handles delivers approximately 4000 pounds at the cutting edge. They are easily portable to the job, in the plant or outside.

HKP

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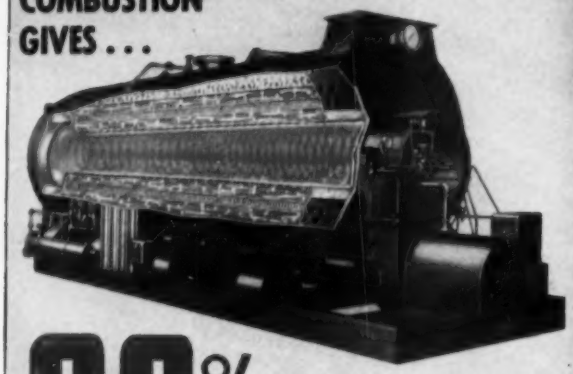
PORTER on the job CUTTERS

H. K. PORTER, INC., Somerville 43, Mass.

ONLY CYCLONIC COMBUSTION GIVES . . .



66% MORE POWER
per sq. ft. of heating surface

By reducing heating surface requirements from 5 to just 3 sq. ft. per B.H.P., Cyclonic Combustion produces 66% more power per sq. ft.—saves up to ⅓ the space of conventional package steam generators. Cyclonic Combustion is the revolutionary new flame control used exclusively in Cyclotherm steam generators. Flame characteristics are controlled in a revolving spiral vortex traveling the full length of the furnace to insure maximum heat transfer without direct flame impingements or hot spots. The cyclonic action of the flame accounts for a 65 to 75% heat transfer within the main fire-tube. This high rate of heat transfer enables Cyclotherm 2 pass generators to maintain a guaranteed minimum efficiency of 80% for any steam requirement.

Cyclotherm steam generators with patented Cyclonic Combustion offer these additional features: Full power operation from a cold start in 15 to 20 minutes; Savings up to 50% on maintenance; Greater fuel savings; Boilers designed for oil or gas operation from 18 to 500 h.p., 15 to 200 psi operation pressure.

Proved superior in thousands of installations, Cyclotherm steam generators with new Cyclonic Combustion offer the most efficient and compact package steam generator on the market today. Find out more about Cyclotherm and Cyclonic Combustion—write today for a free illustrated folder.

The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters Laboratories, Inc.

CYCLOTHERM
STEAM GENERATORS

Cyclotherm Division U. S. Radiator Corp.
Dept. 34
Oswego, New York
Please send without obligation my copy of "All Your Questions Are Answered by Cyclotherm."

NAME .....
FIRM .....
ADDRESS .....
CITY ZONE STATE

ATLAS

DAMPER REGULATORS

- *Sensitive*
- *Hydraulic*
- *Automatic*

Bulletin 4-A gives complete data concerning all ATLAS Damper Regulators. Ask for a copy.

If you need a Damper Regulator for this Service	Specify
Low Pressure Heating Boilers.....	No. 501
Low Pressure and Vapor Heating Boilers	No. 501-8
Medium Pressure Power Boilers.....	No. 502
High Pressure Power Boilers.....	No. 503

For instance, our "Medium Pressure" Regulator No. 502 is pictured above. It is suitable for boiler pressures up to 150 lb. per sq. in. As shown, it is equipped with a compensating attachment that is simple and mechanically correct, permitting the regulator to gradually move the damper on boiler pressure changes of a fraction of a pound. It holds the damper stationary in a partly open position where there is no change in boiler pressure.

The pilot valves are so designed that the slightest change in boiler pressure is sufficient to open or close them, thus causing the regulator to move the damper in either direction, keeping the boiler pressure within the desired close range. It is so sensitive that the damper is moved on boiler pressure changes of ¼ pound.

See list of other ATLAS products below.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
292 South St. Newark 5, N. J.

Represented in Principal Cities of the South

Campbell Boiler-Feed Regulator
Temperature Regulators
Reducing Valves
Exhaust Control System
Pressure Regulators
Pump Governors
Damper Regulators
Back Pressure Valves
Balanced Valves
Control Valves
Float Valves

Technological Exhibit—S.E.

An extensive technological display, featuring the work of the National Bureau of Standards, Office of Technical Services, United States Patent Office, and Government Patents Board in the fields of science and industry, will be presented by the Field Service of the United States Department of Commerce in the New Exhibit Hall of the Atlanta Biltmore Hotel, in ATLANTA, GEORGIA, February 11, 12 and 13.

According to MERRILL C. LOFTON, Regional Director of the Department of Commerce in Atlanta, the exhibit will occupy 14,000 feet of space and will reflect a wide range of information. Included in the display will be processes developed by the Bureau of Standards for the Armed Forces, now made available for civilian use, commercial products developed from material originated or published by the Office of Technical Services, and data on more than 3,000 government-owned patents now ready for free use.

The exhibit will be open to the public without charge.

Alcoa—Rockdale, Texas

ALUMINUM COMPANY OF AMERICA'S ROCKDALE WORKS began production late in November, 1952, as aluminum was poured from the first operating potline. R. T. WHITZEL, Manager of Alcoa's Smelting Division, and J. D. HARPER, Rockdale Works Manager, poured an aluminum pig, which officially signalled the beginning of production at the new plant.

When completed, Alcoa's installation at Rockdale will include a smelting plant with four potlines, in which aluminum will be produced from refined aluminum ore; a plant for the manufacture of carbon electrodes required in the electrolytic aluminum producing process; a power plant for the generation of required electricity; and facilities for mining lignite.

The second potline was to be completed and ready for production early in December, and the third and fourth units are scheduled for completion in the spring but will not be put into operation until the fall of 1953 when a new power plant will be ready for operation.

Electric power for the first two units is being supplied by TEXAS POWER & LIGHT COMPANY until Alcoa's lignite burning power plant is completed. EBASCO SERVICES, INC., is designing and building the power plant, which will be operated for Alcoa by T. P. & L.

The new plant, which will have a capacity to produce about 170 million

DARTS FIT TIGHT, STAY TIGHT because spherical grinding finishes the seats to a true ball joint with wide, true-bearing surfaces. Darts are easily made tight without jamming. They can be used on installation after installation without scarring the seats.

QUICK FACTS

- **TWO BRONZE SEATS** of special alloy offer extra resistance to pitting and corrosion. They provide years of leakproof protection.
- **PRACTICALLY INDESTRUCTIBLE** Dart bodies and nuts consist of top-quality, air-refined malleable iron for extra resistance to stress and stretching.
- **TOUGH, HEAVY SHOULDERS** can take the most severe wrenching without damage.

These features make Darts your best union buy...they assure trouble-free performance year after year.

DART UNION COMPANY
Providence 5, Rhode Island
The Fairbanks Co. — Distributors
Boston•New York•Pittsburgh•Rome, Ga.

DART

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Before burning, the lignite will be dried by a new method developed at Denver, Colorado, under the direction of V. F. Parry, Chief of the Coal Branch, Region IV, and under the sponsorship of Texas Power & Light Company.

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LOOK FOR THESE FEATURES IN STEEL GRATING

1. STRENGTH
2. SAFETY
3. LOW UPKEEP
4. LONG LIFE
5. SELF-CLEANING

BLAW-KNOX ELECTROFORGED® GRATING gives you all five

Regardless of what features are most desirable for your steel grating, you get what you want when you specify "Blaw-Knox." Its electroforged, one-piece construction provides exceptional *strength*, and the twisted cross bars give you a *safe* walking surface. The clean-cut openings—without angle irons—make it *self-cleaning* and easy to paint . . . contribute to *low upkeep*. Blaw-Knox Steel Grating has *long life* because there are no holes or crevices to trap moisture and encourage corrosion. Get the complete story on Blaw-Knox Grating and Stair Treads—write for Bulletin 2365 today.

We factory-fit Blaw-Knox Grating to your dimensions for easy installation.

Grating Department
Blaw-Knox Equipment Division
BLAW-KNOX COMPANY
2034 Farmers Bank Bldg., Pittsburgh 22, Pa.

BLAW-KNOX ELECTROFORGED® STEEL GRATING

Insul-Mastic—Ark., Tex.

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Baker-Raulang, New Orleans

INDUSTRY SERVICES, INC., 332 South Diamond Street, NEW ORLEANS, LOUISIANA, has been appointed distributor for Baker Industrial Trucks in the Delta States area, according to a recent announcement by the BAKER-RAULANG COMPANY.

MR. POLK HEBERT is owner of the company, which will represent Baker in Louisiana and Southern Mississippi. Complete sales engineering and service facilities are maintained by the New Orleans organization.

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The branch is the company's sixteenth in the South and the fourth in Florida. Other Florida branches are in Tampa, Orlando, and Jacksonville.

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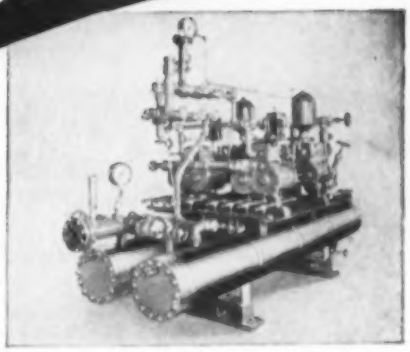
Enco Automatic OIL PUMPING AND HEATING SYSTEM

Completly Coordinated



Two Horizontal Duplex Piston Type Steam Pumps and two fuel oil heaters—capacity 15 G. P. H. at 250 lb. pressure with either pump or heater.

Every detail part of an Enco Automatic Oil-Heating-and-Pumping Unit System is designed, assembled, checked and tested to make sure that it functions as an element of a completely coordinated unit. The sizes of pipes, fittings, valves and other elements are correctly proportioned for the efficient, dependable operation of the unit as a whole. All hand controls are visible and within reach of the operator for quick starting, stopping or cross-over reconnections between duplicate heaters and pumps. Adjustments and cleaning are similarly simplified.

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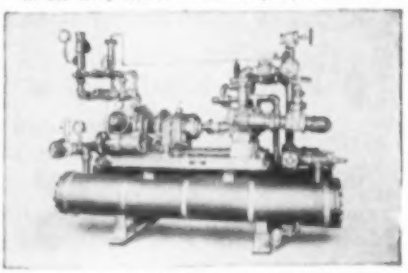

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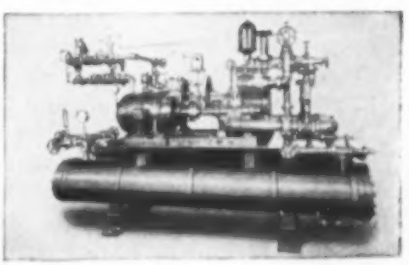

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75 WEST STREET Enco NEW YORK 6, N.Y.

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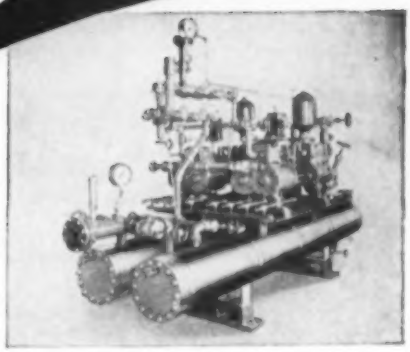

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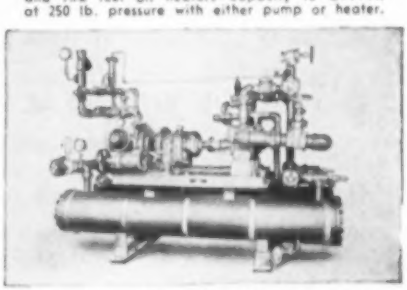

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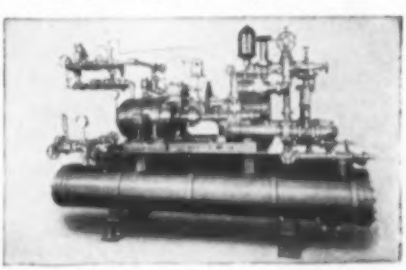

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THE ENGINEER COMPANY

75 WEST STREET Enco NEW YORK 6, N.Y.

Boiler Settings

(*Starts on page* 108)

the effective furnace volume of 748 cu ft calculated above.

Arch Construction

Table 2 shows the coordinates for plotting the load line shown in Fig. 2. In the construction of the catenary shown in Fig. 3, however, a simpler method was used for the construction of the arch form.

This method is dependent on the definition of a catenary curve, which is that curve evolved by a chain of uniform weight supported from two points on a horizontal.

On a flat wall surface fasten a piece of paper 4 ft wide and 9 ft long. Draw a horizontal line 8 ft long; divide this in half and drop a vertical line 2'11" long. Take a piece of chain such as is used in hanging double hung windows. Fasten the end to a nail at one end of the 8 ft horizontal; hold the chain at the other end of the horizontal so that the chain droops to the lower end of the 2'11" vertical. Draw the curve evolved by the chain and you have the curve for the top of the arch form.

Boiler Scale

(*Starts on page* 82)

results of maintaining *too much* excess phosphate. In too great amounts, phosphate may also "push" against and combine with magnesium, forming a magnesium phosphate scale which is "sticky" in nature (an adherent sludge). This is the main reason for controlling the excess phosphate. Also, highly alkaline type phosphates will increase the alkalinity of the water beyond reasonable bounds and can cause foaming or priming (carry over). The normal range specified for excess phosphate is between 20-40 ppm as PO_4.

In order to cause calcium phosphate to occur as the non-adherent sludge, the boiler water Ph (degree of acidity or alkalinity) must be within the range of 10.5 to 11.5. This is another example of the close control necessary in treating a boiler.

Magnesium is removed by simply maintaining sufficient alkalinity in the boiler water so that the sludge magnesium hydroxide is formed. It is then removed by blow down as is the case with calcium.

The alkalinity which provides the right environment for proper magnesium removal may be provided by the phosphate chemical itself. In some cases, caustic soda or soda ash, two strongly alkaline materials, may be added to bring the alkalinity up to the desirable range.

It is important that a reputable feedwater treating concern be consulted and their directions followed when a scale problem is encountered. However, it has been said, "a feedwater treatment is no better than the man who is administering it," and this is all too true. To do a good job, the engineer must have a working knowledge of the subject. In that way he will maintain a cleaner boiler and promote his job to a higher level in the eyes of management through economic savings.

There's NO Seal Like Rectorseal
...for preventing connection leaks

● Rectorseal has been proved by more than 15 years use by the oil industry, where it has been subjected to severest leak-proofing conditions. Rectorseal #2 is specially compounded to meet the specific requirements of industry.

INSOLUBLE IN WATER AND ALL PETROLEUM FRACTIONS

Rectorseal #2 holds natural, manufactured and LP-Gases . . . natural gasoline, butadiene, synthetic rubber and other petroleum based chemicals; also gasoline, diesel and fuel oil. It is unaffected by refrigerant gases, freon, sulphur dioxide. Will not contaminate drinking water. Use it on piping for any of these commodities with complete confidence of leak-proof connections.

EASY TO APPLY . . . ECONOMICAL

Rectorseal #2 is available in convenient, easy-to-use ¼, ½ and 1 pt. brush-top cans . . . also quart and gallon friction-top cans. Thin in the can, it thickens in the joint to a plastic elasticity that maintains a leak-proof seal for the life of the connection. Never hardens or becomes brittle . . . never seizes the threads.

● WRITE FOR ¼ PT. FREE TRIAL CAN TODAY!

and use Rectorseal #2 on your next job. Prove to yourself, "There's no seal like Rectorseal" for preventing connection leaks.

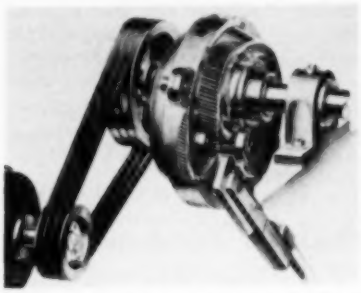
RECTORSEAL, Dept. "V"
2215 Commerce St., Houston 2, Texas

RECTORSEAL
PAT. T. M. REG. U. S. PAT. OFF.
NUMBER TWO

Equipment & Supplies
(Starts on Page 8)

possible by the exclusive three-wall housing.

Gearing and bearings are continuously splash-lubricated by the high-speed gear and the counter-shaft pinion which run in a large oil reservoir in the lower third of the housing.



The American Pulley Company's "Shaft-King"—new series of 20.1 ratio speed-reduction units.

Patented concentric shaft design places both input and output shaft above oil level, therefore bearing seals do not operate against a head of oil.

Interchangeable patented split tapered bushings with locking nuts eliminate fretting-corrosion and make the units immediately adaptable to any shaft size up through 3 15/16 in. The new speed reducers are easily mounted directly on shaft of driven machine and require only standard shaft lengths (twice shaft diameter plus clearance) for mounting.

"Nobrush" Electric Generator . C-8

THE GEORATOR CORPORATION, Electric Products Division, Arlington 9, Virginia, has announced its improved "Nobrush" electric generator. Unit, featured in

Georator Corporation's "Nobrush" electric generator is adapted for portable power units, field supply of 400 cycles, or for operation of newer high frequency portable power tools. Outputs range from 250 va to 25 kva.

New Garlock Molded Cups Folder describes in detail our complete line of cups. Write for your copy today!

GARLOCK MOLDED CUPS

For Pump Pistons— Hydraulic Service— Pneumatic Equipment

A COMPLETE LINE OF CUPS FOR INDUSTRIAL USE

GARLOCK Molded Packing Cups are made from the highest grade materials to rigid specifications for *long, trouble-free service.* These cups are made in many types and styles, each designed and constructed for a specific service condition.

BITAN* Leather Cups, available for practically any cylinder diameter size, are recommended for use against cold and hot water, oils, gases, and solvents. For hot oil service up to 250°F., specify synthetic-rubber-impregnated Bitan leather cups.

Rubber and Synthetic Rubber Cups with fabric insertion are made in a wide range of material combinations for cylinder diameters from less than $\frac{1}{2}$" up to and including 16". For service against air at high or low pressures, against oils, and on heavy duty hydraulic equipment.

Cups for Pump Pistons are available for standard cylinder sizes.

Start cutting maintenance and replacement costs now— standardize on Garlock Molded Cups.

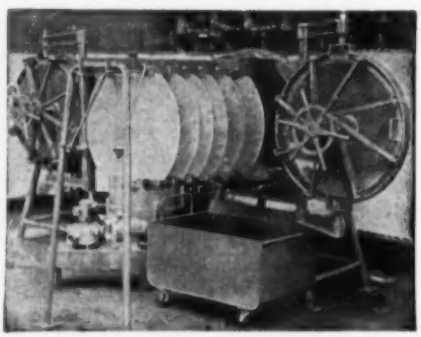
THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

*Registered Trademark

GARLOCK

PACKINGS, GASKETS, OIL SEALS, MECHANICAL SEALS, RUBBER EXPANSION JOINTS

BOILER TUBE CO. OF AMERICA
McKEES ROCKS, PA.
(Pittsburgh District)
PITTSBURGH • CHICAGO • FRED S. RENAULD & CO., LOS ANGELES



EMULSIFIED OR FREE OILS
Effectively Removed from Condensate with the
BLACKBURN-SMITH REFINER
OUTSTANDING ADVANTAGES

1. Breaks the tightest emulsion of oil in water
2. Reduces contamination to less than .1ppm.
3. Produces pure, clean condensate
4. Saves boiler tubes

Contaminated Condensate Formerly Wasted Can Now Be Re-Used After Filtration Through the Refiner

Proved in service . . . saves heat units and fresh water . . . no backwashing . . . reduces boiler maintenance costs . . . improves boiler efficiency . . . simple and inexpensive to operate . . . requires little space.

Write for catalog. Engineering assistance gladly furnished

THE BLACKBURN-SMITH MFG. CO., INC.
98 RIVER STREET, HOBOKEN, NEW JERSEY
Subsidiary of Condenser Service & Engr. Co., Inc.
HOBOKEN 3-4425 RECTOR 2-9360

a 400 cycle type, avoids brushes entirely by a permanent magnet construction.

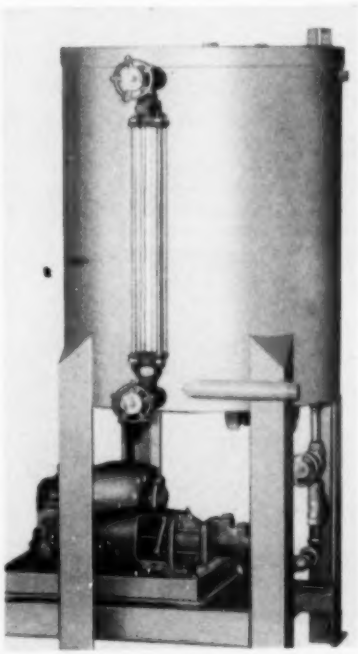
Among advantages attained by this construction are: immunity to damage by moisture, overload, or short-circuit; durability and long life; reduction in size and weight; and almost total elimination of maintenance.

Units are furnished for belt drive or for mounting on driving motor or engine. Complete motor-generator or engine generator sets are available.

"Packaged" Feed System

C-9 MILTON ROY COMPANY, 1321 East Mermaid Lane, Philadelphia 18, Pa., has developed a new compactly designed "packaged" chemical feed system which unitizes the basic elements of a chemical feed system, reducing field piping and offering considerable savings in installation time and space.

The unit consists of a 50 to 500 gal carbon steel chemical solution tank mounted over a controlled volume pump. Piping is supplied for the suction line, complete with valves and sight gauge for reading liquid level.



Milton Roy controlled volume pumps are available in either Simplex or Duplex models, air-powered or motor-driven. Capacities range up to 300 gph and operate against pressures up to 5,000 psi.

Free additional information is available to readers of SP&I. Circle the item code number on one of the reader service post cards provided on page 17-18.

Accessory equipment, including agitators, dissolving baskets, low level alarm panel, electrodes, relays, and other items, can also be supplied.

Pneumatically Operated Butterfly Valve

C-10 MINNEAPOLIS - HONEYWELL REGULATOR CO.'S Industrial Division, Wayne & Windrim Aves., Philadelphia 44, Pa., has developed a pneumatically operated butterfly valve for control of air, water or steam flow.

The pneumatic valve motor is described as a Grad-U-Motor power unit. It operates on a controlled air pressure range of zero to 15 psi. Adjustable mechanical stops provided on the motor enable the wing rotation to be limited for special applications.

The valve is sized from 1½ to 6 in., with screwed connections. Body, wing and trim material is bronze. Maximum operating temperature is 250 F; maximum pressure, 20 psi.

Deck-type Electric Hoist

C-11 THE YALE & TOWNE MANUFACTURING COMPANY, Philadelphia 15, Pa., has announced the availability of new deck-type electric hoists, designed for top mounting in double-girder bridge cranes.

The units feature compactness of design; triple-reduction, spur-geared drive; totally-enclosed, fan-cooled motor; rugged heavy steel suspension frame; and pushbutton-operated heavy-duty contractor.

For safety, the hoists are equipped with two brakes—a Weston-type friction brake in the gear train, and a solenoid-operated contracting drum-type motor brake.

The Yale & Towne Manufacturing Company's deck-type Cable King electric hoist is available in capacities of from 1 to 15 tons.

The control station can be mounted in the crane cab or remotely located. Controls for operation of the trolley and bridge also are available.

GOT A PROBLEM?

BOILER MAINTENANCE?
POWER PLANT REFRACTORIES?
FURNACE LININGS?
SMOKE STACKS?
WATER GAS PLANTS?
INCINERATORS?

Anywhere you use or generate heat, Ironton will be able to help you do a better job by (1) saving labor costs on refractory installations; (2) recommending ways to get longer service from refractories; (3) telling you about new developments in refractory materials. It costs you nothing to get Ironton expert advice on your problem. We are a small "custom service" company, ready to treat every inquiry personally, promptly.

Jot it down here:

Representatives in the South:
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Charlotte, N. C., Phone 55-285
Chattanooga, Tenn., Phone 7-6697
Jacksonville, Florida, Phone 3-5586
Miami, Florida, Phone 82-5782
Silver Spring, Md., JUniper 7-5468
Kentwood, La., Phone 2191

Call or write

RELIABLE REFRACTORIES

THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

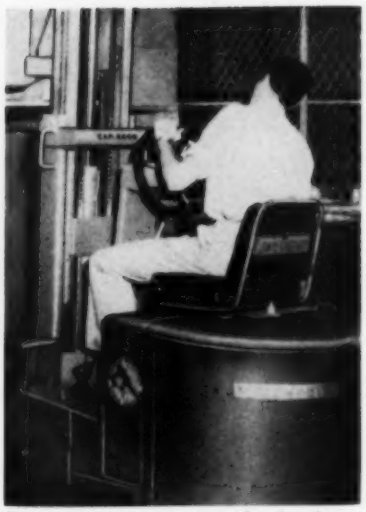
Safety Factors in Fork Truck Design

C-12 LEWIS - SHEPARD, Watertown, Mass., announces special safety features of its 2000 lb capacity electric fork truck.

The lift, lower and tilt are operated by foot. Floor pedals located within easy reach of the left foot along with the accelerator-brake pedal operated by the right foot leave both hands free to handle the steering wheel. The aircraft type cable steering also contributes to easy operation.

The deadman type electric brake is engaged by releasing pressure on the accelerator pedal. Braking is accomplished quickly in one motion, by lifting the foot from the pedal.

Another safety factor is the center of gravity. The mast is mounted directly over the front axle, placing the load 6 in. closer to the axle than in other truck designs. This provides more stability in high lifting operations and allows a more compact truck with less counterweight. The compact design makes it possible to concentrate the weight so that the center of gravity is much lower.



At no time is it necessary for the driver of this *Lewis-Shepard* fork truck to take either hand from the wheel to operate lift, tilt, lower, speed or braking.

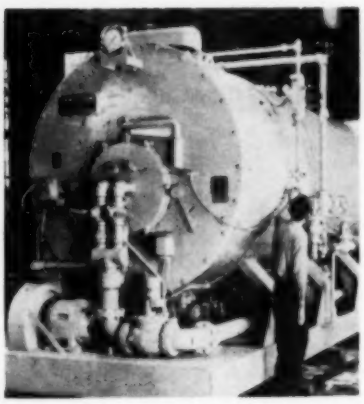
The flow control valve of the hydraulic system is mounted directly at the base of the ram so that any failure of a hose will not cause the load to drop faster than normal lowering speed.

600 hp Packaged Steam Generator

C-13 AMES IRON WORKS, INC., Oswego, N. Y., has added a new 600 hp unit to its line of Amesteam Generators.

Twenty sizes are now available, from 10 to 600 hp, for pressures from 15 to 200 lb steam and for firing with oil, gas or oil-gas combinations.

The generator is a fully automatic, self-contained unit, ready for operation when connected to customer's steam, water, fuel and electric lines, and to his breeching or stack.



A feature of the generator is the complete accessibility of all parts. The automatic controls are in an eye-level panel box. Davit-hinged burner head and flue covers simplify inspection and servicing.

All of the generators are thoroughly fire-tested before shipment and 80 per cent thermal efficiency is guaranteed.

Sewer Cleaning Unit

C-14 FLEXIBLE SEWER-ROD EQUIPMENT COMPANY, 9059 Venice Blvd., Los Angeles 34, Calif., has introduced the new 1953 electric, motor-driven "Flexi-Cleaner," with

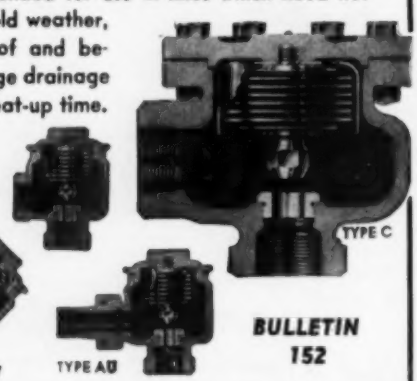
The Flexi-Cleaner operates either right or left, has a 25-1 gear reduction, and three speeds — 125, 250, and 500 rpm.

NICHOLSON MAKES

Freeze-Proof Steam Traps

for Every Plant Use

Because they drain completely when cold, these four types of Nicholson steam traps are positively freeze-proof. Can be freely installed outdoors. Universally recommended for use in lines which need not be in continuous use during cold weather, because they are freeze-proof and because their 2 to 6 times average drainage capacity results in minimum heat-up time. The non-air-binding feature of Nicholson traps also notably facilitates heat transfer in severe weather. Types for every plant use. Sizes ¼" to 2"; pressures to 250 lbs.



BULLETIN 152

175 OREGON ST., WILKES-BARRE, PA.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

which industrial plants can do their own emergency sewer cleaning and maintenance at a savings of time and money.

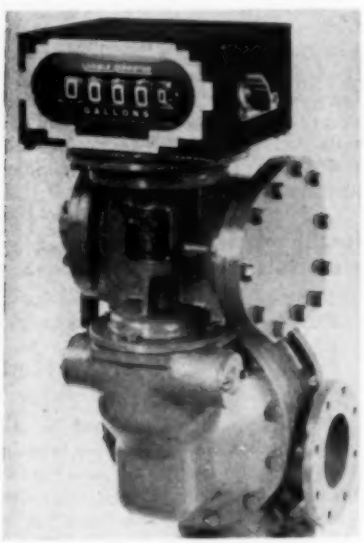
A one-man operated device, the tool features extra heavy coil rod, with coupling every 25 ft, which makes for safe, quick easy operation. An automatic feeding enables the operator to stand behind the machine as a safety factor.

Rotary Displacement Meter Handles Corrosive Liquids

C-15 ROCKWELL MANUFACTURING COMPANY, 400 N. Lexington Ave., Pittsburgh 8, Pa., has developed a new stainless steel industrial meter to handle corrosive liquids common to the cellulose, chemical, food, oils, rubber, pharmaceutical and industrial processing fields.

This new rotary displacement meter is based on the patented Rotocyle Principle. All materials in contact with corrosive liquids are of stainless steel. The meter weighs 120 lb without accessories.

Remote registration, which provides for transferring the reading of the meter register by electrical impulses to a central control room remote from the point where actual measurement takes place; a quantity control register with a built in electric switch that is actuated after a predetermined volume of liquid has passed through the meter; swivel adapters, angle adapters and register extensions can be supplied with the meter.



Meter has a maximum capacity of 100 gpm at a maximum working pressure of 125 psi. Complete meter and register data is included in Bulletin OG-403 of the *Rockwell Manufacturing Company.*

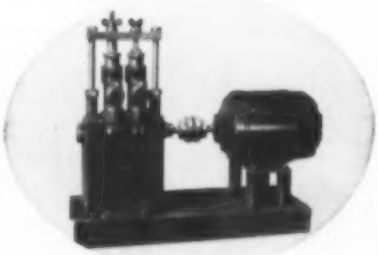
UTMOST PROTECTION

at lowest cost

Manzel CHEMICAL FEEDERS and HYPOCHLORINATORS

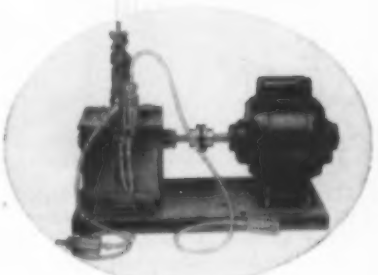
To the cost-conscious operators of industrial plants Manzel Feeders pay dividends in accuracy, dependability, and *surprising* economy of purchase and maintenance. Built by an organization famous for fifty years in the manufacture of automatic force feeding equipment, Manzel design is *thoroughly* proven. Whatever your feeding problem, ask Manzel.

MULTI-FEED CHEMICAL FEEDERS
Any number of pumping units can feed the same or different chemicals simultaneously.



LARGE OR SMALL CAPACITIES
Various models pump from a fraction of a drop to 60 gph. All types of drives are available.

MANZEL HYPOCHLORINATORS
Positive, precise, and *low cost.* Easy to install and service.



Look at these Quality Features

- **Full control**... *accurate adjustment from 0 to full feed.*
- **Wide range** *of feed covers nearly every job.*
- **Positive in action**... *no clogging.*
- **Sight Feed** *and solution strainer.*
- **Easily adjusted** *while running.*

Manzel

318 Babcock Street, Buffalo 15, N. Y.

new equipment (continued)

For more data circle item code number on the postage free post card—p. 17

New High Capacity Impulse Steam Trap

C-16 YARNALL-WARING COMPANY, Philadelphia 18, Pa., has developed a new impulse steam trap for use where condensate must be handled in unusually large quantities.

This new trap, known as the Series 50 Yarway Impulse Steam Trap, is a companion to the company's Series 60 and 120 traps. An important feature of these traps is their ability to maintain high, even temperature in process equipment. Their small size and light weight make them desirable where close quarters piping is involved.

Series 50 traps have proved successful for condensate drainage on heat exchangers and stage heaters, reboilers, reheaters, stills, evaporators, debutanizers, polymerization and gas stabilization units, dryers, slashers, etc.

The basic operating principle of the Series 50 Impulse Trap employs a hinged lever and two valves mounted on a valve seat plate, and the control flow which governs opening and closing action of the valves is obtained by allowing small clearance between inlet and outlet valves and their respective seats when the lever is at rest. An example of the maximum capacity is 17,300 lb of condensate per hour for the 1½ in. size at 100 lb gage, based on condensate 30 F below steam temperature.

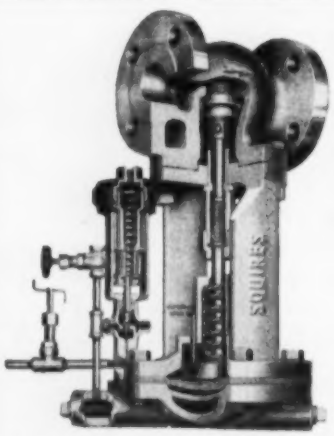
Right Angle Gear Drive

C-17 THE JOHNSON GEAR & MANUFACTURING COMPANY, 8th & Parker St., Berkeley 10, California, have announced their right angle gear drive which makes possible more compact power plant installations, eliminating belt transmissions.

The drive is a "connecting right angle unit" of power transmission between motive power and various types of manufacturing equipment. The drive can be used as a vitally important unit between turbine, centrifugal and rotary pumps connected to power units, steam turbines and electric motors, either for product processing or for fire protection.

The Johnson Drive is most adaptable with equal success when used either with vertical or horizontal

prime movers and can be relied upon for continuous 24-hour service. Installations include gasoline, natural gas, steam, diesel, or electric motor power from 15 to 450 hp with a minimum of maintenance. The drives are manufactured in a wide selection of types, sizes and ratios, and offer wide adaptability in dual, multiple or combination operation.



- Guarantee -
POSITIVE
DEAD END CONTROL
with
SQUIRES
Vertical Reducing Valve

SQUIRES Positive Dead-end Service absolutely guarantees against pressure build up on the reduced pressure side. This control is obtained by the high pressure being magnified in the main valve to give a tremendous closing force on the single seat and disc.

Other outstanding features of the SQUIRES Reducing Valve include accurate pressure control within one ounce variation, broad one step reduction from 600 pounds to ounces and flexibility of installation in either horizontal or vertical lines.

SQUIRES Valves are engineered for low operating and maintenance costs. There is easy access to all working parts without removing the valve from the line.

Available in sizes from ½" through 12" for operation on steam, air or water service. All replacement parts interchangeable for 2½" size and under except valve body stem, seat and disc—an unequalled standardization of parts. Get all the facts for yourself about SQUIRES Vertical Reducing Valve. Write today and ask for Bulletin #107.

THE C. E. SQUIRES COMPANY
Over 50 Years of Dependability
18502 SYRACUSE AVENUE • CLEVELAND 10, OHIO

Books for the Plant Engineer

Weldability of Metals

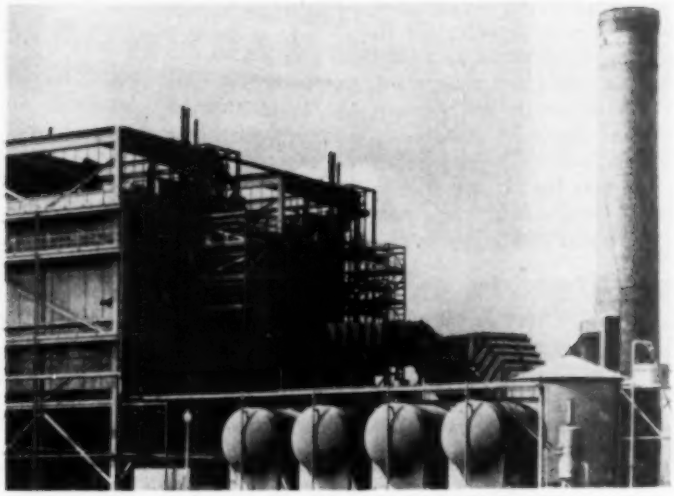
PUBLISHED BY THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Ave., Cleveland 17, Ohio
141 pages
Price, 50¢

"Weldability of Metals," reprinted from the 9th edition of "Procedure Handbook of Arc Welding Design and Practice," explains factors determining weldability; gives causes and cures for hard-to-weld metals; and details welding procedures for steels, nickel, iron, alloys, copper, aluminum, and hard-facing.

Handbook of Manual Materials Handling Equipment

PUBLISHED BY THE CASTER AND FLOOR TRUCK MANUFACTURERS' ASSOCIATION
27 East Monroe St., Chicago 3, Ill.
Price, $1.00

The Handbook is designed to acquaint both industry and the layman with the terminology and basic fundamentals of casters, wheels, hand and floor trucks, pallets and skids. It is intended to give a working knowledge of all types of manual materials handling equipment to aid in considerable cost savings in the movement of materials.



Wrought Iron Employed Extensively in Jacksonville, Fla. Power Plant

THESE four tanks, 12 ft in diameter by 20 ft long, are used for condensate, surge and boiler water storage at the new 60,000 kw power plant of the City of Jacksonville, Fla. They are fabricated of wrought iron plate to protect against damage from corrosion.

Of similar construction is the 25-ft diameter by 20-ft high vertical tank, used to store raw water. Including these installations, more than 185 tons of wrought iron plate and pipe are employed in 23 separate services where there is danger of internal corrosion or exposure to salt air.

Keep Them GUESSING

(*Starts on page 76*)

of the 12 in. steam supply valves whenever the steam consumption of either dryer reached the maximum allowable limit. Thus, regardless of the setting of the control indices on the temperature controllers, there was no possibility of the mill's steam supply system going into a sudden nervous convulsion. Since the heavy board that caused the initial trouble was run only at infrequent intervals, no production problem developed.

The man who had originally specified the temperature controllers had done a fine job as far as his dryers were concerned. He'd ordered the right type of instruments, and they were doing, or trying to do the job he wanted done. He just hadn't figured all the angles. And when the equipment

GENERAL
REG. U.S. PAT. OFF.

RODA — High grade gas, by-product, steam and household stoker coal from Wise County, Virginia, on the Interstate Railroad.

IDENDRON — High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

STONEGA — High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

GLENBROOK — The Premium Kentucky High Splint unmatched for domestic use. Produced in Harlan County, Kentucky, on the L. & N. Railroad.

COKE — Roda and Stonega from Wise County, Va.

CRITERION COAL — High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

HAMPTON COAL — High volatile domestic, steam and by-product coal from Boone and Logan Counties, W. Va., on the Chesapeake & Ohio Ry.

CROZER — Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railway.

LYNCO — High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Virginian Ry.

ANTHRACITE
Hazel Brook—*Premium Lehigh*
Raven Run—*Premium Mahanoy*
Cross Creek—*First Grade Lehigh*

Our engineering service, available upon application, and long and varied experience is your assurance of the Right Coal — Properly Applied.

General Coal Company
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CABLE ADDRESS, GENCO
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BLUEFIELD, W. VA. BUFFALO CHARLOTTE, N. C. CINCINNATI
NEW YORK NORFOLK PITTSBURGH

JEFFERSON

300 LB.
AIR FURNACE
MALLEABLE IRON
AIR-TESTED
UNIONS
with the
RECESSED BRASS SEAT

Do you want to save . . . . now and later?

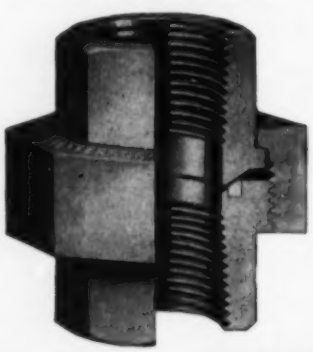
Time and labor can definitely be saved through the use of Jefferson Specialty Unions, because there are types which mean fewer joints and there is always the Recessed Brass Seat which makes up tight with minimum wrench pressure . . . a true ball joint. And the fewer joints to make up, the fewer requiring maintenance.

The name "Jefferson" means high quality . . . the kind you can be certain will give you long, care-free service year after year. And if you use Jefferson 300 lb. Unions, you can tackle those tough jobs with absolute assurance your piping jobs will be RIGHT and stay RIGHT.

Remember these facts: Jefferson Unions are made of malleable iron having a tensile strength of 55,000 p.s.i.; are air tested before shipment; have octagonal ends for any type wrench; OWG 2000# to 2" and 1000# up to 4".

The Jefferson line includes AAR male and female unions. Enduro 300#, Excel 250# and Master 150# unions. All iron seats are also available in all types.

Contact your nearest distributor or us direct for your requirements.



JEFFERSON UNION CO.
650 WEST 26th St., NEW YORK 1.
79 GOODING ST., LOCKPORT, N.Y.
45 FLETCHER Ave., LEXINGTON, MASS.

that you are ordering depends for operation on, or is closely tied in with equipment operated or supervised by someone other than yourself it will be worth the price of a carload of headache powders to you if you will figure every possible angle, and pass the results of your figuring on to the firm who's supplying the equipment.

Needn't Reveal Secrets

In some instances, especially where research or some new process is involved, there exists a natural reluctance to divulge information that might possibly fall into the hands of competitors. Actually, it isn't necessary to release sufficient information to endanger the security of the process, even though you can release information to an instrument manufacturer with the same degree of impunity that you'd talk to your doctor.

For you must remember that the instrument man is not seeking information on the secret phases of a process. He doesn't care whether you are manufacturing sea-sick pills or radioactive toothpaste. However, what he must know in order to do a job for you, are the conditions under which specific instruments will operate. Are highly corrosive fluids involved? Are you toying with extremely high or low pressures or temperatures? What kind of control do you require—must a variable be held within such close limits that the controller winds up and gets ready to slap it back into line as soon as it even thinks of deviating—or will it be quite all right if the instrument holds it within limits of say plus or minus four or five scale graduations? (If the latter is adequate and you specify the former you're going to pay for a Cadillac to pull a plow!)

And, if you have some flow metering applications, be doubly sure to supply the instrument manufacturer with ample information. Even a person totally unfamiliar with instruments can appreciate the fact that measuring the flow of steam presents a problem that differs materially from measuring the flow of Bunker-C fuel oil. And yet, it is not infrequent to receive an order for a flow meter wherein no mention is made of what type fluid is being handled.

MARTINDALE

COMMSTONE HOLDERS

Hold Commstones rigid and true for concentric resurfacing of commutators and slip rings while running at normal speeds in their own bearings. Interchangeable boxes 1", 2" and 3" wide handle grinding jobs up to 4¼" wide.

BLOWERS AND VACUUM CLEANERS

MARTINDALE COMMSTONES AND COMMUTATOR GRINDING TOOLS

MICA UNDERCUTTERS FOR SLOTTING COMMUTATORS

Nine Motor Driven Types

MARTINDALE PROTECTIVE MASKS

PLACE HEADBAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

Weigh less than ½ ounce

Write for 64-page Catalog describing these and many other products for Industrial Maintenance, Safety and Production.

MARTINDALE ELECTRIC CO.
1334 Hird Ave. Cleveland 7, Ohio

Reheat Cycle—Goldsboro Station

(*Starts on page* 68)

Carolina Power & Light Company's newest generating unit features: reheat cycle, outdoor installation, and special arrangement of control panels.

water from an entering temperature of 99 F to 89 F with a wet bulb temperature of 79 F.

Station Controls

The controls of all major plant equipment are mounted on tunnel type control boards in the centrally located, air conditioned control room. The consolidated boiler, turbine, generator control board was designed primarily to accomplish three main objectives: One, concentrate all controls necessary for manual operation of the plant at a single location in an area small enough to be readily under the observation of one man; two, eliminate all hazardous piping from the proximity of the electrical circuits necessary on a board of this type; and, three, arrange and group the instruments on the control board so as to provide a diagrammatic representation of the plant to aid in the training of operating personnel.

To obtain these objectives, it was necessary to eliminate from the front of the board instruments used primarily for obtaining records. These recorders were placed on the back of the tunnel panel. All connections to water, steam, and inflammable oil and gases, as well as meter bodies containing mercury, are remotely located and the intelligence transmitted to the control room either electrically or with low pressure air. To further conserve space, it was necessary to use smaller indicating instruments and controls than are customarily employed. The fact that the instruments are located at eye height, however, tends to compensate for the reduced size. It was also found that the usual drop type annunciators would occupy too much space on a board of this size. Consequently, the lamp type annunciators with one-inch square faces were installed. The illuminated signal on these annunciators can be easily read at a distance of 15 ft.

To facilitate the training of operators, the mimic bus and pipe diagram is painted with different colors:

60 kv Bus or above	
12.5 or 13.8 kv Bus	Red
4.16 kv Bus	Green
480 v Bus	Blue Grey
d-c Bus	Black
Steam piping	White
Condensate piping	Yellow
Circulating water	Orange
Control piping	Red, Violet
Oil piping	Brown

Bare copper leads of the enclosed, segregated phase type conducts the current from the generator through the 4,000 amp, 15 kv generator disconnects to a bank of three General Electric transformers rated at 28,333 kva each when cooled with forced air. Here the voltage is stepped up to either 66 or 115 kv for transmission over the Company system.

The station auxiliary power is obtained from the main generator leads on the transformer side of the generator disconnects through a 7500 kva, 13.2/4.16 kv three phase transformer which supplies a 4,160 v switchgear of the enclosed metal-clad type located in the station basement. Supplied from this 4,160 v switchgear is a 480 v load center unit substation consisting of a 1000 kva dry type transformer and switchgear to furnish power for the 440 v auxiliaries.

Anti-Freeze Protection

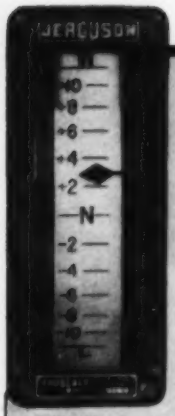
In a plant of this type with much of the major equipment exposed to outdoor winter weather conditions, it was necessary to provide protection for piping, equipment, controls, and other accessories against freezing. The boiler feed piping and all lines above ¾ in. diameter which can either be drained or through which a flow can be maintained at all times were not protected other than by the regular heat insulation, except in a few instances.

Heat is supplied to the anti-freeze protection equipment by thermostatically controlled 220 and 110 v Electric Heating Cable, consisting of Teflon covered No. 19 nichrome resistance wire rated at 6.66 watts per lineal foot and electric strip heaters.

To apply the anti-freeze protection equipment properly, it was necessary to separate the installation into two systems—*Cold Pipes* and *Hot or Cold Insulated Pipes*. The Cold Pipe system includes cold water piping, compressed air piping, and all other lines which require protection, but never exceed 125 F in temperature; while the Hot or Cold Insulated Pipe system includes all lines requiring protection which may be either hot or cold. All the piping included in the latter system has a covering of regular heat insulation.

On the Cold Pipe system two coats of Socony 13-F-20 weather resistant paint were applied prior to the application of the heating cable. The cable was installed on the lines by two different methods, depending upon the size of the line. On the 2 in. nominal pipe sizes, or bundles of small tubing up to 2½ in. O.D., a single run of cable was attached to the bottom of the pipe, or run inside of a bundle or group; while for pipe sizes above 2½ in. nominal diameter, or bundles of small tubing above 2½ in. O.D., the cable was applied spirally at the rate of 1½ lineal feet per square foot of bare external pipe surface. In either application, the cable was attached to the bare pipe every six inches with a three-inch length of Scotch Electric Tape.

After the heating cable was installed, either a 1 in. or 1½ in. (1 in. on pipes up to 8 in. in diameter) thickness of Foamglass insulation was applied and held in place with monel wire—two per 18 in. width of insulation. This Foamglass insulation was then brushed with one coat of Nerva-Plast cold set-



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ting cement. Next, a covering of .019 in. corrugated aluminum was installed with the longitudinal joint on the bottom on horizontal runs and the ends overlapped about one inch.

All joints were then sealed continuously with Nerva-Plast to form a weatherproof joint. The aluminum jacket was then further secured by applying single turns of aluminum bands at 16 in. intervals and at all cement sealed lap joints.

On the Hot or Cold Insulated Pipe system the regular heat insulation was first wrapped with a single ply of building paper and then wrapped with a single ply of 0.004 in. aluminum foil. The heating cable was either run straight or wound spirally around the aluminum foil depending upon the diameter of the pipe and heat insulation. Again the cable was attached every 6 in. with Scotch Electric Tape. Next, the Foamglass insulation was placed over the heating cable and brushed with a coat of Nerva-Plast cement. The corrugated aluminum covering was then attached in the same manner as on the Cold Pipe system.

On valves and fittings where it was impractical to install the outside corrugated aluminum covering, the Nerva-Plast was painted with a coat of aluminum paint.

Since the anti-freeze system was so designed that enough heat would be available for protection and at the same time sufficient heat could be dissipated so that the cable would not burn out or have its life unduly impaired, any cable lengths that were not entirely utilized upon reaching the end of a pipe run were used by either installing a jumper and continuing on the nearest line or by running the excess cable in a conduit exposed to the ambient outdoor temperature.

Splicing of the heating cable on unusually long continuous runs was precluded by installing two cables connected in parallel and spiraled around the pipe at an increased pitch, thus materially increasing the length of the cable runs. As to the neoprene covered lead and return wires, where it was necessary to run them along the pipes, they were placed just inside the weatherproof corrugated aluminum covering.

Practically all of the cold water piping at the intake structure was insulated similar to the Cold Piping system except the heating cable was omitted, since these lines can be protected from freezing either by draining or by maintaining a continuous flow.

Plant Organization

The sixty total average number of employees at this plant normally work forty hours per week. The plant organization is headed by the Plant Superintendent who has three supervisors reporting directly to him: The Operating Supervisor, the Test Supervisor, and the Maintenance Supervisor.

Reporting directly to the Operating Supervisor are six Foremen —five Shift Foremen and an Outside Foreman. The plant is operated by four men on each shift: a Shift Foreman, a Control Operator, and two Auxiliary Operators. The coal unloading and storage crew, under the supervision of the Outside Foreman, work only one eight-hour shift per day. The laboratory personnel, headed by the Test Supervisor, is comprised of Engineers, Cadet Engineers, Metermen, Testers, and Helpers. The plant maintenance work is directed by the Maintenance Supervisor through an Electric Foreman and a Mechanic Foreman.

Air Preheaters

(*Starts on page* 96)

whichever is most convenient. Provisions for disposal of the wash water should be included in the duct system. When washing during operation, the air side may be preferred when dust collecting equipment is located beyond the air preheater.

Many sources of wash water, such as well water, river water, evaporated make-up, blowdown, feedwater, house water, etc., are used. Hot water (150 to 200F) is very much preferred to cold water, and hot alkaline water is better than untreated hot water. In ad-

dition, the use of alkaline water will help the operator to determine when the preheater has been thoroughly washed by comparing the pH of the effluent with that of the wash water. Soft water should be used where possible.

For vertical and inverted type preheaters, the pressure required for the wash water is that needed to deliver the desired rate of flow from the nozzle and is normally less than 50 psig. For horizontal preheaters, a higher velocity of the water jet will be required and normally a water pressure of 100 psig is desirable. The rate of water flow at the higher pressure required for horizontal preheaters can be controlled by the diameter of the washing nozzle or nipple on the cleaning device.

A guide for the quality and quantity of water desirable for washing will be found in Fig. 4.

If water washing is improperly performed, the water soluble constituents are leached from the deposit without disturbing the insoluble constituents; thus over a period of time, an insoluble deposit is accumulated.

Where several heaters serve one boiler, it may be possible to wash the heater under light load. In this case, the boiler output is reduced to approximately 50 to 60 per cent of full load and the heater isolated by dampers.

Additives

The possibility of reducing corrosion and plugging of air heaters by additives to the fuel shows promise according to the recent announcement of one of the boiler companies. This company developed a process of adding alumina or dolomite to the fuel oil. While the initial objective was to reduce high temperature deposits, they have found that the additives appreciably lower the dew point of the gases. If future results continue to show promise, this should provide a relatively simple and low cost solution to the problem.

Studies Continue

The writers hope that these comments may be of some assistance to the designers and operators in their efforts to cope with a very difficult problem. Insofar as the air heater design is concerned, every effort is being expended to improve the situation by continued research and design development. In this respect, it might be mentioned that the results of a joint project between the authors' company and the U. S. Bureau of Mines should be available in published form in the near future. This report will deal with low temperature flue gas corrosion. It will include the results of field and laboratory testing on the suitability of a large number of materials. This will summarize investigations that have been in process over a period of nearly eight years.

The authors would like to express their appreciation to the members of the staff who assisted in the preparation of figures, and for their helpful suggestions. Further indebtedness must be acknowledged to the authors of many previous papers on this subject. In addition, we are grateful to our customers for their cooperation.

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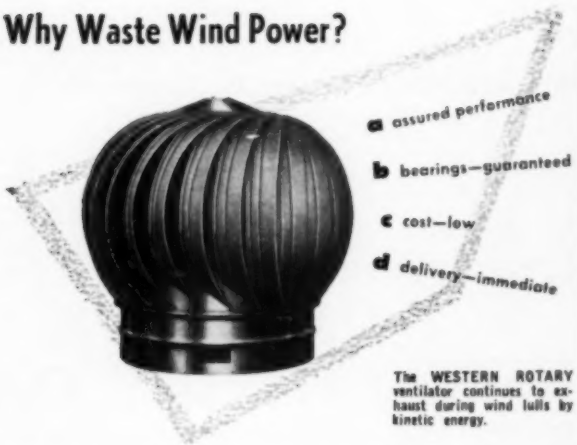

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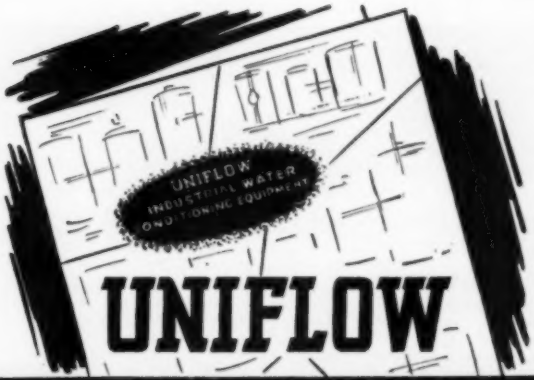

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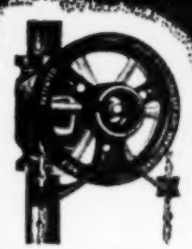

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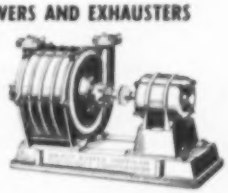

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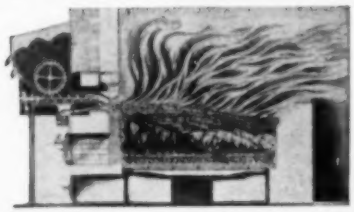

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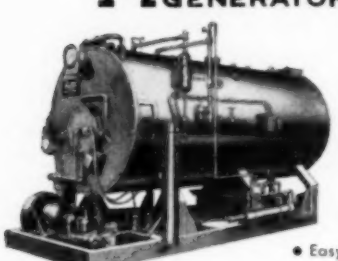

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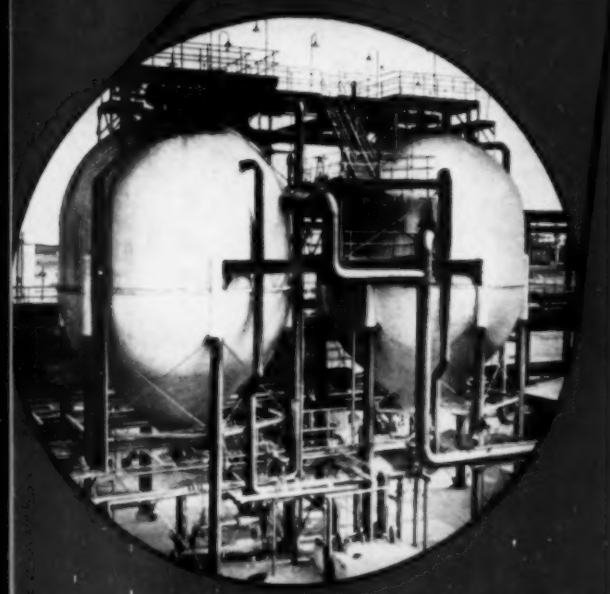

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